REPORT

ON THE OPERATIONS OF THE

DEPARTMENT OF AGRICULTURE

BURMA

FOR THE YEAR ENDING 30TH JUNE 1908

1906-07 to 1909-10

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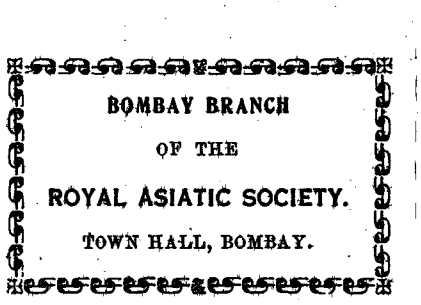

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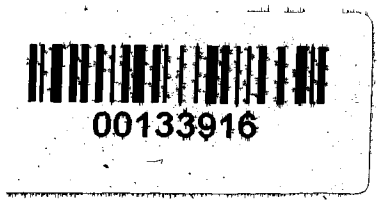
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From A. E. T. SARPAS, Esq., Assistant Secretary to the Financial Commissioner, Burma, to the Revenue Secretary to the Government of Burma,—No. 655—5R.-97, dated the 12th September 1907

I am directed to transmit the Annual Report on the Operations of the Agricultural Department, Burma, for the year ending the 30th June 1907. This is the first Report submitted for the Agricultural Department separately from the Department of Land Records. No orders have been issued regarding the form of the Report, but it contains matter similar to that contained in paragraphs 18 to 21 of the Land Records Administration Report for the year ending the 30th June 1906, and in other respects it generally follows the lines of the report of the Punjab Agricultural Department for the same year. The Report has been submitted in print, and I am to solicit that this course may be approved for future years. No maximum length has yet been prescribed. A length of 12 pages will probably be sufficient.

2. It is unfortunate that no laboratory has been available for the Agricultural Chemist to work in, and Mr. Warth has therefore been obliged to devote his whole time to the study of Burmese and to other preparations for the work of research and instruction.

3. Various matters concerning the organization of the Agricultural Department still await the orders of Government, and plans for the future are still being discussed. It will not serve any useful purpose to enter in detail into these matters here.

4. The Director's recommendations regarding the future working of experimental gardens will be awaited.

5. The outstanding feature of the year is the increase in the cultivation of groundnut. Reports have been received that groundnut-oil is liable to ferment in certain conditions, and this is one of the matters to which the attention of the Agricultural Chemist has been directed.

6. The failure of the attempt to cultivate wheat at Kengtung is to be regretted and the Financial Commissioner does not consider that the experiment should be finally abandoned.

7. Mr. Gates agrees that the distribution of English vegetable seeds can now be largely curtailed and that private individuals can supply themselves from seedsmen with the seeds required for their gardens.

8. It has been decided to continue to hold agricultural shows at suitable places and to take more vigorous steps to advertize the shows beforehand, and to attract exhibitors and spectators.

9. At present the Financial Commissioner is not anxious to organize Co-operative Societies for agricultural production or for the joint ownership of agricultural machines. These developments will come at a later period, but co-operation in obtaining pecuniary loans for cultivators is still a novelty which requires careful fostering.

10. There was little achievement in the year of report, but preparations were made for work to be undertaken in succeeding years, and Mr. Gates has confidence that as much energy as possible will be evinced by Mr. MacKenna in utilizing the Scientific Staff.

REPORT

ON THE

Operations of the Department of Agriculture, Burma,

For the year ending the 30th June 1907.

PART I.

ADMINISTRATIVE.

Personnel.

1. The creation of a separate appointment of Director of Agriculture in Burma was sanctioned by His Majesty's Secretary of State for India in his Despatch No. 17 (Revenue), dated the 26th of January 1906. On my return from leave I was appointed Director of Agriculture with headquarters at Mandalay and assumed charge of my duties on the forenoon of the 15th October 1906. On that date the formal separation of the Agricultural Department from the combined Departments of Land Records and Agriculture took place. Prior to my return the work of the Department was carried on by the Settlement Commissioner and Director of Land Records and Agriculture.

Period covered by the Report.

2. In accordance with the orders conveyed in Government of India, Revenue and Agricultural Department, Circular No. 6—231-1, dated the 8th March 1906, this Report is submitted for the year ending the 30th June 1907.

Tours.

3. I was on tour for 117 days. No arrangements for my office staff were made till my return from leave, and until an office establishment was sanctioned and selected I was dependent on the office of the Settlement Commissioner and Director of Land Records. In consequence I had to spend the greater part of November in Rangoon disposing of papers that had been kept pending, and arranging for the transfer of office files, etc., to Mandalay. On the arrival of the Agricultural Chemist I made a short tour with him to Myaungmya and Bassein in order to introduce him to the cultivation of the Delta and to show him the principles of rice-milling.

In December I was unable to do any touring for private reasons; but in January I visited Kyaukse District to complete my enquiries about sugar-cane cultivation and Myingyan where the cotton and ground-nut market were at their briskest. The cotton was this year of much whiter quality than I remember formerly to have seen; but it is perhaps too much to claim as the cause of this the special selection of seed and the distribution of selected seed made by Government in 1905. This may have contributed to the result; but the main factor was probably the absence of showers during the final stages of growth. The cotton is now all graded by the mills; only the best seed is re-issued to cultivators who are ready buyers. In time an improvement in staple and colour may be hoped for. Ground-nut now rivals cotton in popularity in Myingyan. The enormous increases in this cultivation within recent years will be commented upon later in this Report. In February I inspected the Experimental Garden at Katha and the remainder of the month was occupied with the meeting of the Board of Agriculture at Cawnpore. In March I visited Bhamo to attend the Cattle Show there and then proceeded to Akyab to discuss various questions in connection with the alleged deterioration of the paddy crop in Arakan. In May I met, in Rangoon, Mr. Thompstone who was transferred from Bombay as Principal of the College of Agriculture: took him over rice mills and introduced him to various firms connected with rice, cotton and agricultural implements. At the end of June I did a short

trip with Mr. McKerral, the newly appointed Deputy Director of Agriculture, in the Delta, where agricultural operations were in full swing. In addition to paddy, jute and tobacco were studied, and, at Bassein, Mr. McKerral was thoroughly initiated into the process of rice-milling.

Expert Staff.

4. In his Despatch sanctioning the appointment of a Director of Agriculture, the Secretary of State also sanctioned the engagement of an Expert staff consisting of—

(*a*) an all round Agriculturist to be Principal of the College;

(*b*) an Agricultural Chemist;

(*c*) an Agricultural Botanist.

The appointment of a Deputy Director of Agriculture was sanctioned by the Secretary of State in his Despatch No. 226 (Revenue), dated the 14th December 1906. Sanction was not accorded to the entertainment of an Entomologist and Mycologist who were included in the original proposals of the Government of Burma.

Agricultural Chemist.

5. Of this Expert Staff the first to arrive was Mr. F. J. Warth, B.Sc. (London), M.Sc. (Birmingham), who had been selected as Agricultural Chemist. He reached Rangoon on the 19th October 1906. As no laboratory had been erected I made every effort to find a place for him to work. None of the officers consulted could give any facilities for the particular class of work contemplated. Proposals were therefore framed and sanction obtained to the early construction of a laboratory for the training of Native Assistants, etc., and for such researches and analyses as may be possible at the outstart, and, as I write, tenders for the construction of this building have been called for. With the exception of the period from December 1906 to February 1907 when he was working in the Laboratory of the Imperial Agricultural Chemist at Pusa and attending the Board of Agriculture at Cawnpore, Mr. Warth has been engaged in the study of Burmese cultivation, and on the plans and fittings of his private laboratory and of the Chemical side of the College; in indents for apparatus and books and in the study of Burmese in which he has made fair progress.

Principal of the College.

6. Mr. Thompstone, B.Sc., of the Indian Agricultural Service and Assistant to the Deputy Director of Agriculture, Bombay, was selected by the Government of India as Principal of the Agricultural College here.

As it was considered advisable that he should visit Pusa and Nagpur before coming to Burma he was permitted by the Local Government to assume charge of his duties at Poona. He did so on the 15th April 1907 and reached Burma on the 1st May 1907. Since his arrival Mr. Thompstone has been fully occupied with the plans of the College, the scheme of studies and the laying out of the College Agricultural Station at Mandalay. By the end of June he had made an excellent start.

Deputy Director of Agriculture.

7. Mr. A. McKerral, M.A., B.Sc., of the Indian Agricultural Service was selected by the Government of India to fill the appointment of Deputy Director of Agriculture. He arrived at Rangoon on the 31st May 1907. He came on at once to Mandalay as I thought he would see the general line of work best at the Agricultural Station there and as it was desirable that he should meet the other members of the staff. On the 18th June he left Mandalay to join me at Rangoon. We then made a tour of the Delta studying the agricultural conditions prevailing there. At the end of June Mr. McKerral, after a halt at Hmawbi, where the Agricultural Station of Lower Burma is situated, and a study of the indigenous methods of cultivation carried on there proceeded on an extended tour in the Tharrawaddy, Prome, Thayetmyo, Minbu and Magwe Districts, to familiarize himself with the varied cultivation of the country.

8. From the above paragraphs it will be seen that I had practically no Scientific Staff of whom any use could be made till quite the end of the year under report, and this fact must explain meagreness of the record of work so far as the propagation of the principles of scientific agriculture is concerned.

Subordinate Scientific Staff.

9. None of the Subordinate Scientific Staff have as yet been recruited with the exception of an Entomological Assistant Mr. K. D. Shroff, B. A. (Bombay). He was appointed on the 19th March 1906 and, till my return, worked, practically, directly under the orders of the Imperial Entomologist. He has now been placed under the orders of the Principal of the College. His work during the period under report consisted principally of a general and economic collection of insects in duplicate for the Pusa and Mandalay College Museums: with specific investigations of tobacco-pests at Bassein: observations of lac insects in the Northern Shan States and an investigation of orange diseases and pests in the Amherst District. This latter enquiry was in connection with a representation which I have made to the Imperial Mycologist that the blight of the orange crop might form a suitable subject for investigation. The local enquiries made seem to indicate that it is rather a fungus than an insect pest.

From the 6th November 1906 to the 20th January 1907, Mr. Shroff was engaged, at the request of the Revenue Secretary, on the classification and re-arrangement of the specimens in the Provincial Phayre Museum. For this work he was commended by the Local Government.

Mr. Shroff has devoted himself to the study of Burmese in which he has made good progress. He has now passed the examination by the Higher Standard.

Recruitment of Subordinate Staff.

10. It is not proposed to recruit any of the Subordinate Scientific Staff until the Chemical Laboratory is equipped but numerous applications have been received and it is hoped that it may be possible to recruit all the necessary establishment from Burmans and Burman-Eurasians. While the construction of the main College building will be a matter of considerable time it is hoped that the training of agricultural assistants and chemical assistants can be commenced early in 1908.

Courses for the staff at present employed on the Mandalay Farm have been arranged to commence on 2nd September 1907, and certain of these trained men will be drafted to Hmawbi and other farms.

Buildings.

11. As regards buildings, more progress has been made in the direction of discussion than of construction. At the end of the year under report no buildings whatever had been commenced. Frequent changes of Executive Engineers in charge of the Mandalay Division, diversity of opinions about plans and, finally, a proposal to delay final decision till the merits of re-enforced concrete had been discussed, have been the chief causes of delay. The result is that from a state when degrees of urgency could be distinguished everything is now, owing to the commencement of work on the Mandalay Station, very urgent. Plans and estimates for the following buildings have, however, now gone in and it is hoped that their construction will shortly be commenced:—

(*a*) The Director's Office.

(*b*) Quarters for the Principal of the College and the Expert Staff.

(*c*) Estimate for the fencing of the Mandalay Farm.

(*d*) Estimate for the sinking of a tube well at the Mandalay Farm.

In addition the plans of the Farm Buildings, of the College, and of the quarters for the subordinate and menial staff are well advanced. It is hoped that considerable progress with the construction will have been made by the end of the current financial year.

The Executive Engineer in charge of the work, Mr. J. M'F. Petters, was specially deputed to Pusa, where he received much assistance in the discussion of the plans from the Imperial Experts.

PART II.

AGRICULTURAL STATIONS AND EXPERIMENTAL GARDENS.

Number of stations.

12. The scheme for the Department contemplates three main agricultural stations: one at Mandalay, the College Station under the charge of the Principal of the College: one at Hmawbi in the Hanthawaddy District, for the study of paddy and other Lower Burma crops: and one in the dry zone of Upper Burma. These two stations will be under the charge of the Deputy Director of Agriculture. The land for the first two named has already been acquired: the site for the third will be selected shortly by the Expert Staff in consultation. Even at this early stage in the development of the Department my attention has been drawn to various places where a small demonstration plot for a particular purpose would prove useful. These are certain to increase and in their multiplication will lie the principal means of success of the Department. They will be developed as a trained staff becomes available. Amongst the more definite proposals for early action are a small experiment, somewhere near Maymyo, in *taungya* cultivation, with a view to making it more permanent, and the desirability of starting a farm at Ma-ubin for jute and other fibres.

Agricultural Station, Mandalay.

13. As Mr. Thompstone, Principal of the College, the officer in charge of the Agricultural Station, Mandalay, did not arrive in Mandalay till the middle of May and as, therefore, only a modest beginning had been made with the farm by the 30th of June, a special report on this station is not submitted for this year. It is enough to remark that a good start has been made in clearing, levelling, road and bund-making, etc. In anticipation of Mr. Thompstone's arrival I had samples of all known varieties of Upper Burma crops from each district collected with a view to their identification and classification. For the first year the work will follow mainly indigenous methods of cultivation and will not be, to any great extent, experimental. But the land is being laid out in a permanent way and the rough work of bringing the farm into uniformity will be practically completed. We have been much handicapped by the lack of buildings. In consequence practically all the labour and cattle are hired at daily rates which adds enormously to the expense of cultivation. A few temporary buildings have been erected, but they are a poor substitute for permanent ones.

Agricultural Station, Hmawbi.

14. The land acquired for this Agricultural Station has, as last year, been leased out to cultivators, with the exception of a small portion which has been reserved for experiments with cold weather crops. Work could not be commenced this year at Hmawbi owing to the late arrival of the Deputy Director of Agriculture. The Deputy Director will, however, be frequently at Hmawbi; he is making a thorough study of the selected land and should be able to lay it out permanently during the cold weather so that a good start can be effected next cultivating season.

Experimental gardens.

15. The various experimental gardens in the Province have now been taken over by the Department of Agriculture. The continuance of some of them is a matter of questionable utility. The Taunggyi garden in the Southern Shan States should, on its past reputation and present results, probably be maintained. So also should the Falam Garden, in the Chin Hills. Considering the remote situation of this garden its receipts are quite respectable in comparison with those of more favourably situated gardens, and there are indications that the surrounding population are taking a practical interest in the results obtained. The Myitkyina garden should probably also be retained for a few years longer. On the other hand it seems doubtful whether the Sinlumkaba garden in the Bhamo District, the Sima garden in the Myitkyina District, and the Katha garden in Katha should be retained. I had hoped to have inspected most of these gardens during the past year but unfortunately

was unable to do so owing to their remote location and the time involved in visiting them. This year I hope to visit all except the Falam garden and I shall then submit definite proposals for each.

Sinlumkaba, Bhamo District.

16. The reports received from these gardens, with the exception of those from Myitkyina and Taunggyi, contain little of interest. At Sinlumkaba the only fruit trees that give any promise are apples and pears. Excellent results (as might have been expected) are reported with English vegetables. "In the flower garden the roses grow to perfection and the flowers are the admiration of all visitors." This is very satisfactory but it is rather a case of wasting "sweetness on the desert air." It would be more satisfactory to know that some interest was being taken in the cultivation by the Kachins and that there was a demand for the young trees.

Falam, Chin Hills.

17. The Falam garden, in the Chin Hills, seems to be run on throughly practical lines. The usual successes and failures with exotic fruit trees are noted; plums and greengages succeeding best. But more practical, experiments are also carried on. Potatoes are well established and are widely cultivated while this year extensive experiments were carried out both in the experimental garden and at various centres with wheat and barley. The results of experiments with wheat were quite satisfactory. The Superintendent writes, "The wheat grown this season and also that which is being ordered from the Shan States will be distributed to the Chiefs of villages all over the hills. In this manner it is hoped that the cultivation of wheat will be taken up by the Chins in which case there should be no difficulty in obtaining a sufficient supply for local requirements." Barley was only partially successful. The experiments will be continued this year.

Katha.

18. The results of the Katha garden are most disappointing. Experiment there is none: while, as a commercial concern, it cannot be called a success. The original idea of this garden was fruit-culture. This now plays a very secondary part. I incline to think that this garden should be taken over by the Agricultural Department and run more or less on commercial lines for the supply of vegetables, etc., to the people of Katha and neighbourhood, and for more carefully conducted fruit-tree experiments. This point will be decided very shortly after the garden has been inspected by Mr. Thompstone.

Myitkyina.

19. Of the Myitkyina gardens that at Myitkyina shows fair results. Peaches succeed excellently: export to Mandalay and Rangoon should be attempted. Peaches from a private garden in Myitkyina were, this year, placed on the Rangoon Market. Plums also do well. Apricots, cherries, pears and apples failed, but the Avocada pear, the loquat, orange, pomelo, walnut and nectarine have done well. The garden has been the means of stimulating the cultivation of various fruits in the district and I understand from Mr. Hertz that when one or two more varieties have been established the garden may be considered to have fulfilled its function. An attempt should be made to place the fruit, both of the garden and of private gardeners, on the Mandalay and the Rangoon markets.

Sima.

On the other hand it is difficult to see what useful object can be served by the retention of the garden at Sima. There is apparently no population either to buy produce or to copy experiments and the garden records few successes and no receipts. It seems that it might without disadvantage be closed.

Taunggyi, Southern Shan States.

20. The Taunggyi Report is, again, very encouraging. The expenditure has been somewhat high owing to the laying down of water pipes and the replacement of old implements, while the receipts have not been so large as usual. This is due to the fact that the principal demand this year has been for peach-grafts and that the supply

is, at present, short of the demand. As usual a number of probationers have been trained in the garden and those who qualified have been sent back to the Chiefs who deputed them.

Experiments with buckwheat and sunflower have proved very successful: it is hoped by next year there will be sufficient of the latter for oil-extraction. Potatoes continue a great success and Swede turnips of 5 lbs. weight have been produced. Mangel Wurzel failed. Considerable success has been obtained with clover, and if this can be produced in exportable quantities it will be a great matter for the fodder supply of the country.

Paspalum dilatatum also succeeded well. Coffee cultivation was again successful. A main line of work in this garden is in connection with fruit. Mangoes, though growing slowly, are in good condition. The Brazil apple, rose apple, soursop, Malta orange, guavas and pomelos are all doing well. Vines of the Black Hamburg, Foster's seedling and Country White varieties, have not done as well as was expected. They will be grafted on to the wild vines. The American Dewberry has done fairly well: the Avocada pear is firmly established and the White Mulberry thrives exceedingly and grows rapidly. On the whole, much useful work is being done by Mr. Colyear and his staff. It might be well if an occasional advertisement were issued showing what fruit trees are available for sale.

District Gardens.

21. It only remains to mention a new development originated by Major Macnabb, when Deputy Commissioner of Sagaing, *i.e.*, the district garden. The primary object of this was the production of young trees for road-side planting: but one or two useful experiments, notably with cotton, were also tried. The multiplication of these gardens would be an excellent thing. They cost little to run and probably do as much good as much more ambitious ventures.

22. The total expenditure under all heads on the maintenance and upkeep of the gardens amounted to Rs. 10,388 and receipts from sales of produce to Rs. 1,585. The nett Government expenditure was thus Rs. 8,803. The annual outlay on these gardens is out of all proportion to any good resulting from them: and, unless they can show better results, some of them must be closed.

PART III.

EXPERIMENTAL CULTIVATION THROUGH DISTRICT AGENCY: DISTRIBUTION OF SEEDS, ETC.

23. Arrangements for the usual distribution of imported seeds were made prior to my return from leave. Despite repeated failures the district indents remain fairly normal and there is little evidence that any particular trouble is taken in correcting mistakes or in avoiding previous causes of failure. With the development of experimental stations greater caution will be exercised in this direction: exotic seeds will first be tried on the experimental farms before they are issued to districts and the likelihood of success will be fully considered. The seed distributed will be the seed obtained on our own farms of which the germination will be tested: while imported seeds (except Sutton's) will also be tested for germination before issue.

Tobacco (*Nicotiana tabacum*).

24. During 1906-07, 81 pounds of Havana and 78 pounds of Virginia seeds procured from America were distributed to 21 districts and the Shan States. The results of the experiments are not at all encouraging. The cultivation was a success in Myitkyina, Toungoo, Tharrawaddy and Minbu. Partial successes were reported from Hanthawaddy, Bhamo, Henzada and the Western Subdivision of the Southern Shan States, and complete failures were reported from Yamèthin, Pakôkku, Ma-ubin, Bassein, Northern Shan States, Mandalay, Tavoy, Ruby Mines, Shwebo, Lower Chindwin (so far as the Havana variety was concerned) Akyab, Thayetmyo, Prome, and Pyapôn, and at Mole, Maingalakyun and Tapinalet in the Bhamo District. The failures,

were due either to seeds not germinating or to destruction by insects or floods and in a few cases to carelessness on the part of the cultivator. It is very noticeable that in the majority of cases the seeds supplied are reported to have failed to germinate. The germinating power of all future importations will be thoroughly tested before issue. When one considers the remarkable success of imported Havana tobacco in Ma-ubin District, one is inclined to think that failures in similarly situated districts must be due to carelessness and indifference.

Ground-nut (*Arachis Hypogæa Linn*).

25. The remarkable advance within recent years of this form of cultivation is one of our greatest successes in seed distribution. In 1902-03 there were only 3,866 acres under ground-nut in the whole of Burma, of which Magwe District had 3,241 acres. In 1903-04 there were 11,731 acres of which Magwe contributed 9,668 acres and Myingyan 822. In 1904-05, the total area was 15,880 acres of which Magwe had 12,774 acres and Myingyan 2,384. In 1905-06 the provincial crop rose to 37,110 acres of which Magwe contributed 25,604 acres, Myingyan 9,782 and the Lower Chindwin 849 acres. In 1906-07 the total crop aggregates 78,743 acres, of which Magwe has 42,542, acres, Myingyan 31,337 and the Lower Chindwin 1,789 acres. The crop seems likely to extend considerably in these districts and in Meiktila, Yamèthin, Sagaing, Pakôkku and Thayetmyo.

In experiments to introduce this crop into new districts during the year, Yamèthin and Northern Arakan report successes. The Deputy Commissioner, Yamèthin, writes, "Although the year under report was unfavourable, owing to the failure of the rains, the experiments have been successful generally. Agriculturists have now found out that ground-nut can withstand drought better than sessamum and is at the same time as valuable a crop." He considers further experiments unnecessary as seed has now been disseminated throughout the tracts in which ground-nut can be successfully grown. In the Sandoway District the experiment failed in the Taungup and Sandoway Townships but in the Gwa Township the experiment was a success. The Commissioner of Arakan considers that there is a great future for this form of cultivation along the sea coast as the results of the present experiments are very promising. I agree with this view and shall arrange for the supply of the necessary seed. In the Pyapôn District the experiment was successful in the Bogalè Township and unsuccessful in the Pyapôn Township, owing to want of interest on the part of the cultivators. In this district it is difficult for anything to compete with paddy. Failures were reported from Akyab, Tharrawaddy, Tavoy, Henzada and Shwebo.

The Deputy Commissioner, Akyab, assigns the cause of failure to the seeds having reached him in bad condition. There is always a risk of this when seeds are sent by sea. At Tharrawaddy the failure was due to heavy rainfall, at Shwebo to bad seeds and at Henzada to the nature of the soil and insects. The Deputy Commissioner states that no one is anxious to make further experiments. Past experience indicates that there is no advantage in forcing this cultivation: it will expand naturally where there is prospect of a demand. Towards the close of the year, in consultation with the Commissioner of Minbu Division, an effort has been made to extend the cultivation in the Pakôkku District by the introduction of a large quantity of seed from Magwe. Ground-nut seems to be indicated as the coming crop of the dry zone and the mercantile community are doing everything by the erection of mills, etc., to cope with the increased crop.

Cotton.

26. Experiments with exotic cottons were carried on, on a small scale, during the year under report. In the Sagaing District, experiments were made with six varieties of cotton, Texas Burr, extra early Carolina, Russell's Big Boll, Excelsior, King's and Sea Island Cotton. With the exception of the last-named the experiments were a success. Samples of each kind were sent to this office for opinion. The samples were all superior to the indigenous Burmese cotton but there appears to be a tendency to degeneration. A portion of the seed from this crop will be grown this year on the Mandalay Experimental Station. The same varieties with the addition of Caravonica, were tried in the Western Subdivision of the Southern Shan States. Frost affected Caravonica and the Assistant Superintendent notes

that it seems to suffer more from insect pests than the other varieties. Early Carolina Prolific proved the hardiest and a good producer. Excelsior and Texas Burr have not cropped so heavily, King's cotton and Russel's Big Boll produce few but large bolls. In Myingyan an experiment was made with Peruvian cotton seed but it proved a failure. In the same district the Burma Cotton Company sowed Caravonica cotton seed. The trees came up well and large bolls formed. These, however, dropped off before coming to maturity. The plants then withered and died. In Tavoy an experiment with Pernambuco cotton received from Amherst was a failure.

In Kyauksè the cultivation of the Wagale variety of cotton was a failure as also in the Lower Chindwin District.

The failures of the experiments conducted over a series of years by the Burma Cotton Company at Myingyan are, disappointing. Every precaution has been taken but failure has always ensued. Careful experiments will be made on the Mandalay and Dry Zone Farms, and it is hoped that the possibility or impossibility of successfully growing exotics will soon be finally proved. We are beginning with a classification of the indigenous Burmese cottons.

Paddy.

27. Experiments with Paungmalaung paddy failed in the Lower Chindwin, Minbu, Myingyan, Sagaing, Pakôkku and Magwe Districts on account of unfavourable rains.

The experiment was a complete success in Meiktila while successes were reported from Kyauksè, Yamèthin and Mandalay. An experiment with Tadaungbo paddy at Yamèthin was successful although floods from the Paunglaung River did some slight damage. In Myingyan an experiment with Aman paddy obtained from Bengal was unsuccessful owing to want of rain.

For the approaching season considerable quantities of Tadaungbo paddy are being distributed while, on a representation from Akyab, 500 baskets of "moisture resisting" paddy have been imported from Moulmein.

Wheat.

28. An experiment in the cultivation of wheat at Kèngtūng in the Southern Shan States failed on account of the apathy of the *Sawbwa*. The Superintendent remarks that no interest is taken in its cultivation and none will be taken till wheat pays better. At Hsipaw in the Northern Shan States the standing crop at the beginning of the year promised well but later in some parts of the State the plants died from want of rain.

The successes in the Chin Hills have already been noted. A classification of Burma wheat is being undertaken on the Mandalay Farm.

English vegetable seeds.

29. To talk of "Experiments" with English vegetable seeds at this time of the day is absurd; and the distribution of these will be much curtailed in the future. It is now perfectly well known that English vegetable seeds will grow excellently all over Burma if properly looked after and given a sufficiency of water. The "Experiments" are either carried out by Burmans who have not the least interest in the subject or more frequently by private individuals who could quite well pay for the seeds themselves. It is hardly necessary to analyse the reports received, in which failures bulk largely. But at St. John's Leper Asylum, Mandalay, where some trouble was taken, practically everything succeeded, and it is to charitable institutions such as this that gratuitous distribution in the future will be chiefly confined.

Miscellaneous cultivation.

30. Oats from the Southern Shan States were tried at Kyauksè but failed. The *Zizyphus* (zi-cho-thi) failed both in Pegu and Minbu. In both cases the seeds arrived in bad condition. The Nathabu variety of plantains was tried at Minbu but failed for want of rain. In Sagaing four pounds of *Crotalaria Striata* were sown and the growth of the plants was luxuriant. Eucalyptus was tried in the Northern Shan States. The seeds which were supplied by the Reporter on Economic Products were bad and did not germinate. Indigo seed from Pakôkku was tried at Yamèthin; the result was a complete failure owing to want of rain.

PART IV.

MISCELLANEOUS.

Economic products.

31. During the year under report a number of products of economic value were collected through the agency of District Officers and sent to the Reporter on Economic Products, Calcutta. Among the most important were—

(*a*) Samples of a root known as Wet-mye-sa-u.

(*b*) Burmese millets (Sat and Lu).

(*c*) Leaves of the Pandanus.

(*d*) Samples of Sagawa, Sagasein, Myetsat, Kayaucho and Thi-thi or Thi-bin.

(*e*) Samples of Embelia Robusta.

(*f*) Samples of flowers and fruits of Taraktogenos Kurzii and Cynocardia Odorata commonly known among the Burmese as Kalawthi.

Notes on a few indigenous fibre plants were made by Mr. Aubert, B.A., Superintendent of Land Records, Yamèthin, and sent on to the Reporter on Economic Products.

Agricultural and Live-Stock Shows.

32. During the year only two Shows were held: one at Bhamo and the other, a small local one, at Pindaya in the Southern Shan States. The question of the desirability of either continuing or discontinuing these shows was taken up by this Department and proposals submitted to Government advocating their continuance.

These have been accepted and arrangements are now being made to hold shows annually at Bhamo and at the Agricultural Stations of Mandalay and Hmawbi. The management of the Bhamo Show will be left in the hands of the Deputy Commissioner, but the Mandalay and Hmawbi Shows will be directly under the control of this Department. They will not be started till the Department is more fully organised.

The statement below exhibits the cost of the two Shows held during 1906-07.

Place of Show.	Date.	Provincial grant.	Imperial grant.	Prizes.	Contingencies.	Total.	Remarks.
1	2	3	4	5	6	7	8
		Rs.	Rs.	Rs.	Rs.	Rs.	
Pindaya ...	23rd February 1907.	100	...	135*	...	135	* The extra Rs. 35 was met by the Superintendent and Assistant Superintendent, Southern Shan States.
Bhamo ...	7th and 8th March 1907.	1,650	100	1,012	603	1,615	

33. At Pindaya the show, which was a small local one, organised by the Assistant Superintendent, was held on the 23rd February 1907. Fear of plague affected both the number of entries and the attendance of spectators. The prize-winners were, however, fully up to the standard of those exhibited in previous years at Taunggyi and Rs. 135 was given away in prizes. Neither the Superintendent, Civil Veterinary Department, nor I, attended this show.

Bhamo.

34. This Agricultural and Live-Stock Show was held on the 7th and 8th March 1907, and was attended by Mr. Rennie, Superintendent, Civil Veterinary Department, and myself. The exhibits were very unequal but buffaloes, as a class, were of quite exceptional merit, bullocks and oxen were fair, poultry good, while exhibits of agricultural

produce and paddy were particularly good. Potatoes were of quite extraordinary merit: I have never seen better in Burma. Ponies, pigs, mules, and sheep, on the contrary, were distinctly poor.

Apart from the quality of the exhibits a most gratifying feature was the amount of interest taken in the judging by the general public. This show will be continued. The fair has not yet proved much of a success and the prize-winners evinced no particular desire to sell; but if the event becomes annual there is no doubt more business will be transacted. Many were deterred from coming this year by fear of plague. On this occasion three medals presented by the Inspector-General, Civil Veterinary Department, India, were awarded; two for bull buffaloes, magnificent animals, and one for the best oxen bull.

Agricultural education.

35. A scheme of instruction for the Subordinate Staff on the Experimental Station and for apprentices has been framed. The course will begin on the 2nd September 1907. The whole question of the relation of Agricultural to General Education isalso under discussion with the Director of Public Instruction and on the conclusion of this discussion the curriculum of the College will be drawn up.

Formation of District Agricultural Associations.

36. The formation of District Agricultural Associations will ultimately be attempted but the country is not yet ripe for them. It is possible they will be most successfully worked in connection with the Co-operative Credit Societies which are gaining a footing in Burma. I have studied the system both in Egypt and in India, but their formation in Burma may be deferred for the present and until the Department is more fully developed and has useful improvements to communicate. It may be of interest to note that an Association of the kind has already been formed in Arakan independent of Government support. The objects of this Association are to induce the cultivators to adopt better methods of harvesting and winnowing and so put their produce on the market in better condition.

Dissemination of results of experiments.

37. As experimental work has not yet begun no literature has been published. Bulletins will, however, be issued as necessity arises.

Conclusion.

38. For the greater period of the year under Report, I was without any Scientific Staff, so that, beyond preliminary arrangements, it can be said that little has been effected. An interest has, however, been awakened both in the commercial world and amongst prominent Burmans, and I feel confident that when we have results to show they will be eagerly assimilated by the cultivator. The people everywhere evince an intelligent interest in our doings and I feel sure, will eagerly seek advice and assistance. This we shall soon be able to give them.

J. MACKENNA,
Director of Agriculture, Burma.

MANDALAY, *7th August* 1907.

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LIBRARY OF THE BOMBAY BRANCH OF THE ROYAL ASIATIC SOCIETY.

Receipts and Expenditure of Experimental Cultivation during 1906-07.

(*Paragraph* 21.)

No.	Station.	Budget allotment.	Receipts from sale of products.	Expenditure.							Remarks.
				Establishment.	Purchase of seed.	Upkeep of garden.	Feed and keep of stock.	Miscellaneous contingencies.	Purchase of live-stock and agricultural implements.	Total.	
1	2	3	4	5	6	7	8	9	10	11	12
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
1	Bhamo (Sinlumkaba) ...	1,785	182	1,306	...	130	4	136	...	1,576	
2	Chin Hills (Falam) ...	1,360	332	720	185	305	...	150	...	1,360	
3	Katha	1,970	328	1,196	46	...	...	14	...	1,256	
4	Myitkyina (Myitkyina and Sima).	1,999	307	1,056	93	499	...	203	8	1,859	
5	Southern Shan States (Taunggyi).	4,646	436	3,082	145	791	50	167	102	4,337	
6	Distribution of seed from Headquarters.	4,500	...	...	3,450	...	...	...	...	3,450	
7	Distribution of Agricultural implements.	500	...	...	...	...	...	...	...	...	
8	Sericulture	1,000	...	...	...	...	...	...	...	...	
	Total ...	17,760	1,585	7,360	3,919	1,725	54	670	110	13,838	

G. B. C. P. O.—No. 18, D. of A., 6-12-1907—285—J. S.

REPORT

ON THE OPERATIONS OF THE

DEPARTMENT OF AGRICULTURE

BURMA

For the year ending the 30th June 1908

RANGOON

OFFICE OF THE SUPERINTENDENT, GOVERNMENT PRINTING, BURMA

1908

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From A. E. T. SARPAS, Esq., Assistant Secretary to the Financial Commissioner, Burma, to the Revenue Secretary to the Government of Burma,—No. 622—5R.-97, dated the 17th September 1908.

I am directed to transmit the report on the operations of the Department of Agriculture for the year ending the 30th June 1908.

2. The cultivation of ground-nut continued to expand and the efforts made under the supervision of Mr. Grant, the Deputy Commissioner of Pakôkku, to supply selected seed have been largely successful.

3. The proposals contained in paragraph 27 of the report regarding the introduction of varieties of ground-nut seed which are resistant to the *tikka* disease are sound.

4. The success of the introduction of a new variety of paddy into the Akyab District is gratifying.

5. An Agricultural Botanist has not yet been secured, but an Assistant Botanist of good attainments and some experience was appointed in June 1908.

6. Financial exigencies necessitated the suspension of work on the Hmawbi farm, and the Deputy Director, Mr. McKerral has thus been afforded an opportunity of making himself acquainted with local conditions and with the language of the people so that he will eventually be in a better position to apply his expert knowledge to the improvement of indigenous methods.

7. Mr. Gates agrees in the policy stated in the last sentence of paragraph 25 to the effect that further experiments in winter cultivation in Lower Burma will be made only with crops which have succeeded at agricultural stations.

8. The report on the Mandalay Agricultural station which was promised in paragraph 11 of this report has been received, but as it relates mainly to preparations it has not been considered necessary to print it. Owing to the lack of fencing and to depredations by both men and beasts, work on the agricultural farm at Mandalay was much hampered.

9. It is proposed to make a beginning with a course of agricultural instruction in the building which was at first intended for the office of the Director. A scheme for the further development of agricultural instruction has been elaborated and is under consideration.

10. The popularity of the leaflets issued by the Department deserves to be noted.

11. Mr. Gates believes it will be of much value and assistance to District Officers and others to have a staff of officers from whom they can expect to receive sound advice upon agricultural questions. Many officers who are zealous to improve the methods of agriculture and the condition of the agriculturists have not the time to make themselves acquainted with the records of failures and successes which have taken place in similar localities. It will be the business of the Agricultural Department to digest this information and to be ready to give the results of their experience and their learning to all who apply for it.

12. The development of the proposal to supply parboiled rice to Ceylon will be watched with interest. It is however more of a manufacturing than an agricultural question.

13. Mr. Mackenna and the expert staff have made satisfactory advance in the preparations for future development.

REPORT

ON THE

Operations of the Department of Agriculture, Burma,

For the year ending the 30th June 1908.

PART I.

ADMINISTRATIVE.

Personal.

1. I was in charge of the Department throughout the year under report. I also held charge of the current duties of the Commissioner of Settlements and Land Records in addition to my own from the 24th of September to the 8th of November 1907.

Tours.

2. I was on tour for 169 days during the year and visited the following districts: Ma-ubin, Henzada, Bassein, Amherst, Thatôn, Hanthawaddy and Akyab in Lower Burma and Bhamo, Myitkyina, Shwebo, Pakôkku, Kyauksè and Meiktila in Upper Burma. January was occupied with an extended tour in company with Dr. Butler, Imperial Mycologist, to investigate the orange disease, diseases of sugar-cane and groundnut. In February I attended the Indian Veterinary Conference at Calcutta and the Board of Agriculture Meeting at Pusa. Frequent visits were also paid during the year to the Hmawbi Agricultural Station.

Expert Staff.

3. An Agricultural Botanist has not yet been posted to Burma so that the superior staff of the Department is as reported last year.

The Principal of the Agricultural College.

4. Mr. Thompstone, B. Sc., has been fully occupied during the year in the laying out of the College Farm, the training of the subordinate staff, the framing of curricula and the compilation of lessons on Agriculture and other leaflets. He toured with me in August in Kyauksè to study the irrigation methods of the district: visited Maymyo and Myingyan with the Imperial Mycologist and accompanied me to Pakôkku in connection with the extension of groundnut cultivation. In February he visited the dry zone tract of country lying to the west of the Samon River in the Kyauksè District for the purpose of ascertaining the practicability of well-irrigation. In March he inspected the Katha and Sinlumkaba Gardens and attended the Bhamo Cattle Show. In June he personally supervised the laying out of the Katha Experimental Garden. His time has been fully occupied during the year.

Deputy Director of Agriculture.

5. The Deputy Director (Mr. A. McKerral, M.A., B.Sc.) has devoted the time which was not spent on the Hmawbi Farm and in the supervision of cold weather experiments at Sangin in the Ma-ubin District, to the acquisition of a thorough knowledge of the indigenous crops and methods of cultivation. He has also spent various periods on the Mandalay Agricultural Station. In August he assisted me in the choice of the site for a dry zone farm at Meiktila and in working out the scheme of buildings and the laying out of the Hmawbi Farm. He also initiated some experiments in jute growing at Yandoon on behalf of private individuals. He also assisted the Agricultural Chemist in the choice of a suitable site for a series of experiments in connection with the utilization of river silt. In June he sat for the examination in Burmese and passed by the Lower Standard; and then took charge of the

Mandalay Agricultural Station during the absence of Mr. Thompstone on tour. He will now be engaged on the Agricultural Survey of various districts beginning with Myingyan. While it is, for some reasons, a pity that we have been unable to continue work on the Hmawbi Farm this year and so, the sooner, show definite results, Mr. McKerral will, in the interval, be able to acquire a thorough knowledge of the country and of the language which will simplify his work and lead probably to the framing of quicker and more useful lines of experiment than, without local knowledge, he would have been able to devise.

The Agricultural Chemist.

6. The Agricultural Chemist, Mr. F. J. Warth, M.Sc., has been principally occupied with the equipment of his laboratory which is now practically completed. He assisted in the training of the Farm Staff, lecturing on Elementary Chemistry and Physics and, towards the end of the year, commenced the training of two apprentices for Junior Assistantships. He has done some preliminary work on the laterite soils of the Province and on the chemical properties of the juice of the toddy-palm and has framed a scheme for a series of experiments on the utilization of river silt on the lines of Sir Edward Buck's proposals. Mr. Warth passed in Burmese by the Lower Standard in November 1907 and appeared for the examination by the Higher Standard in June 1908.

Subordinate Scientific Staff.

7. The subordinate scientific staff now consists of Mr. K. D. Shroff, B.A. (Bombay) for Entomology: Mr. A. M. Sawyer for Botany and Mr. D. B. Darabsett, B.Sc. (Bombay) for Chemistry. The latter had not joined by the end of the year. It is to be regretted that no Burmans could be got for these appointments. All the junior posts will, however, be filled by Burmans and they will ultimately succeed to the higher appointments. A scheme for the development of the Subordinate Scientific and College Staff has been framed and will be submitted shortly.

The Entomological Assistant.

8. Mr. Shroff has, during the year, made large additions to the general and economic collections of insects and the work of rearing some of the insect pests has been continued. The life history of the orange borer has been almost worked out. The Mandalay Agricultural Station has, unfortunately, supplied him with a sufficiency of material and he was kept busy dealing with the numerous pests discovered there. In addition he advised on various references from the districts. He also lectured on Entomology to the subordinate staff and to Burman teachers and Deputy Inspectors of Schools. He is also compiling simple lessons on Entomology for incorporation in the Text-Books of the Department.

The Botanical Assistant.

9. Mr. Sawyer has been placed in charge of the cotton, wheat and paddy surveys now in progress on the Mandalay Station.

Buildings.

10. The following works have been completed, or almost completed, during the year:—

(1) The Chemical Laboratory (except for a temporary water supply now being installed).

(2) A tube-well; but a pump and condenser have not yet been supplied.

(3) The fencing of the Hmawbi Farm (completed, but requires further strengthening).

(4) The Director's Office (nearing completion).

(5) The road to the Mandalay Farm is under construction and will shortly be completed. In addition three water courses from the Patheingyi distributary have been made in the Mandalay Farm by the Irrigation Department the funds being found by the Agricultural Department.

The following estimates have been sanctioned but have not yet been put in hand :—

(1) The fencing of the Mandalay Farm. Some delay has been caused by the rejection of the fence originally supplied, but it is hoped this work will soon be completed.

(2) Cooly barracks at Mandalay (not funded).

(3) Quarters for overseers and sub-overseers at Mandalay (not funded).

The following estimates have been prepared and submitted for sanction :—

(1) The Farm buildings, Mandalay.

(2) Dhobie's tanks.

(3) Quarters for Superintendent of Farm.

(4) Hostels and Dining-room.

A rough plan of the buildings required at Hmawbi has also been submitted and estimates are being worked out.

PART II.

AGRICULTURAL STATIONS AND EXPERIMENTAL GARDENS.

Number of Stations.

11. The College Station at Mandalay was fully worked during the year under report. A separate Report on the working of this Station will be submitted by Mr. Thompstone. At Hmawbi a few experiments in cold weather cultivation were undertaken by the Deputy Director. Both stations were visited during the year by the Financial Commissioner. In August the site for the dry zone farm at Meiktila was selected by the Deputy Director and myself in consultation with the Executive Engineer (Irrigation) but it is not proposed to start operations there till 1910. A site for *taungya* experiments near Maymyo has not yet been selected nor have we, as yet, any assistant sufficiently trained to supervise such experiments. The selection of a site will, however, receive early attention.

Agricultural Station, Hmawbi.

12. As noted in last year's Report this farm, with the exception of a small area, was leased out to cultivators. On the area reserved a series of tentative experiments were conducted to ascertain whether the paddy soils of Lower Burma can be made to produce, economically, a crop duing the winter season. If this can be done the economic advantages to the country will be considerable. In the first place it may be possible to take a crop off after paddy and if, as is probable, such a crop is leguminous, the cultivator will not only get two crops a year but will also have the benefits of the nitrogen fixed by the legumes. Again, importance is added to experiments of this kind by the fact that there are large tracts of land in Lower Burma so flooded during the rains that paddy cannot be grown there. The discovery of a cold weather crop which could be grown in such tracts would therefore be a matter of great economic importance. The experiments this year are naturally of a rough character and it is fortunate that nothing involving continuity was projected as the Local Government found themselves unable to finance the Station after the 1st of April so that work had to stop then. The object of the experiments really was to see what crops would grow in the cold weather in Lower Burma and consequently many different kinds of crops were tried. They consisted of wheat, jowar, maize, gram, *pegyi*, *pegya*, *pebyugale*, Sunn Hemp (*crotolaria juncea*), jute and two varieties of Egyptian cotton.

13. In this first attempt it cannot be said that any measure of success was attained. Wheat failed totally and it seems improbable that any attempts to grow it on ordinary Lower Burma lands will be successful. The various peas and beans, with gram, gave the most promise of success but the question of cost of cultivation, on a commercial scale, will have to be worked out before we can recommend them to the ordinary cultivator. Jute and sunn hemp were not successful : and their cultivation in the cold weather, without irrigation, seems hopeless. Jowar and maize also failed. The results with Egyptian cotton—Abassi and Afifi—were remarkable. The growth was quite good, though the plants were rather small, but the crop was ruined by the early rains this year.

14. While the definite results obtained were few, these trials have indicated one or two fresh lines of experiment. The failures may be attributed to :—

(1) the excessive difficulty of cultivating this Lower Burma soil which consists of a stiff clay overlying a very stiff subsoil of bluish clay;

(2) the want of moisture in the soil;

(3) the want of any proper cold weather which, to a plant like wheat, is an essential to successful growth;

(4) the nature of the soil which is too stiff and clayey in composition for the roots to penetrate sufficiently to reach the water stratum.

The indications are

(1) that wheat will not grow on paddy land;

(2) that, for the other crops, monthly sowings of small plots should be made throughout the year to ascertain the correct time for sowing of each crop. Cotton, jute and sunn hemp and the various peas and beans may succeed, if sown at the right time;

(3) that the effect of green manuring on the stiff texture of the soil is a most important line of experiment.

In addition to these experiments the laying out of the experimental part of the farm was commenced. The farm has now been enclosed by a fence which will require some strengthening before it will prove satisfactory, and estimates for some of the farm buildings are being prepared.

Experimental Gardens.

15. The result of the inspection of these gardens is that the Sima Garden has been closed on the recommendation of the Deputy Commissioner: the Katha Garden has been taken over by the Department of Agriculture and is being run under the direct orders of the Principal of the College: proposals have been submitted for a change in the scheme of the Sinlumkaba Garden and the Myitkyina Garden has been retained for a few years more. I regret I have been unable, as yet, to visit Taunggyi.

Sinlumkaba, Bhamo District.

16. This garden was inspected by Mr. Thompstone in March. As a result of the state of affairs disclosed, proposals have been submitted to close the garden not later than the 31st of December 1908 after such fruit trees as are worth transplanting have been moved to Katha. It is suggested that a portion of the annual allotment thus released should be devoted to experiments in connection with *taungya* cultivation in the Kachin Hills.

Myitkyina District, Sima and Myitkyina.

17. As noted above the Sima Garden has been closed on the recommendation of the Deputy Commissioner. The Myitkyina Garden was inspected by the Director of Agriculture in April. It is in excellent order, due to the fact that the district has had a succession of Deputy Commissioners who have taken a keen personal interest in it. Peaches, limes and a few other fruit trees have been successfully introduced into the district and the garden will be retained until loquats, lichees and apricots have been similarly established. The garden will then have fulfilled the object with which it was started and may then be closed.

Chin Hills, Falam.

18. This garden really forms the centre from which various agricultural experiments in the hills are controlled. The reports from the Chin Hills always reflect a considerable amount of personal interest on the part of the Superintendent. Peaches do not seem to do well anywhere in the Hills, owing probably to lack of pruning and, possibly, an unfavourable aspect. Plums and greengages however succeed excellently as do apples at Haka. Sufficient experience has now been gained to show what trees are likely to succeed. Special attention should now be devoted to the general introduction of these while those which it is clear will not succeed should be abandoned. English vegetables, onions and potatoes have all done well but the cultivation of the latter is limited on account of the small market for them. The experiments with wheat and barley will be referred to later.

19. The garden was inspected in March by Mr. Thompstone and the present conduct of it completely condemned. The garden has been taken over by the Agricultural Department: a staff sent from Mandalay: and a preliminary laying out done under the personal supervision of Mr. Thompstone. Better results may be looked for in a year or two.

Katha.

20. Sir George Scott acknowledges his obligations to Mr. C. E. Browne for the interest he takes in this garden and the very interesting and valuable experiments he makes in his private garden at Thamakan. The report from this garden is, again, very interesting. The receipts have increased considerably while the expenditure has shown a correspondingly large decrease. Fruit seedling grafts have succeeded well and the following are now available for sale:—

Taunggyi, Southern Shan States.

Apple 500	Peach 300
Plum 100	Cherry 500

Pear 1,500.

The States appear too cold for Sea Island and Caravonica cotton; the latter is much attacked by the red bug. Havana and Virginia tobacco are only moderately successful and their superiority to the local Lang Kö of the Mawkmai State is questioned. Buck wheat and sun flower (Sutton's Giant Yellow) did very well but the small yield of oil from the latter makes it more expensive than local oils and it is thought that a better policy will be to extend groundnut which has been established in the States for 50 years. Potatoes, cloves, coffee and tea have all succeeded. As regards fruit trees, much better results appear to be obtained at Thamakan than at Taunggyi. As regards individual varieties the reports are much as last year. But the conditions are being carefully studied and all possible improvements in location and pruning are being carried out.

The training of probationers continued. It was deemed desirable to dispense with the services of Mr. Colyear during the year. Maung Se, the Head Gardener, has been promoted in his place.

21. The total expenditure, under all heads, on the maintenance and upkeep of the gardens amounted to Rs. 9,502 and receipts from sales of produce to Rs. 1,539. The nett Government expenditure was thus Rs. 7,963.

Financial aspect.

PART III.

EXPERIMENTAL CULTIVATION THROUGH DISTRICT AGENCY: DISTRIBUTION OF SEEDS, ETC.

22. On a representation of the Burma Chamber of Commerce that the quality of Arakan rice was becoming more and more unsuited to the demands of the European market on account of its exceptional susceptibility to the absorption of moisture I was directed by the Local Government to take steps to procure seed of suitable "moisture resisting" varieties and to distribute it to cultivators in the Akyab District who were willing to grow it. Enquiries were accordingly instituted in Moulmein as to what grade of paddy was, in the opinion of the local millers, best suited to the conditions of Akyab. Local opinion favoured the varieties known as "Kaukkyi-byat" and "Shangale" and the Deputy Commissioner, Moulmein, was requested to forward 300 baskets of the former variety and 200 baskets of the latter, the assistance of local rice millers being enlisted in the selection of the seed. I visited Akyab in March 1907 to discuss the method of distribution with the Deputy Commissioner. I found that there was a considerable enquiry for the seed, which had been extensively advertised, and it was decided to sell the seed, in each township, at a moderate

Introduction of "moisture resisting" paddy into Akyab District.

price, the cost of transport and handling being borne by Government. Cultivators were warned not to sell all the produce but to retain a portion for sale to their neighbours as seed and as a seed supply for themselves for the following year.

23. On revisiting Akyab this year to ascertain the results of the experiment I was gratified to find a general approval of the new grain. The people have taken enthusiastically to it and they have got much increased outturns: the millers are pleased with its milling properties: and—most satisfactory of all—the people have followed the advice given them and it is believed that some 5,000 baskets have been kept for seed this year. In these circumstances Major Stone and I were of opinion that nothing further was necessary this year except to keep as close a supervision as possible on the dissemination of the stored seed: advise the people to continue to store a part of the crop as seed and, above all, not to mix this seed with the impure local varieties. Cultivator's leaflet No. 6 embodying these precepts was written and circulated in Burmese and Bengali. Further Government action will be decided on when the results of this year's crop are known. The Local Government has already expressed its appreciation of the interest taken in the matter by Major Stone, the Deputy Commissioner and Mr. E. M. Körper, the Superintendent of Land Records.

Winter cultivation at Sangin, Ma-ubin District.

24. Early in the year Mr. Clayton (then Deputy Commissioner, Ma-ubin) enquired whether nothing could be done to introduce winter cultivation in the flooded portions of the Yandoon Subdivision where owing to floods, the cultivation of paddy in the rains is impossible. The cultivation of "tadaungbo" paddy is also impossible owing to the strong rush of water. In August I did an extended tour of the Yandoon Subdivision with Mr. Clayton and, after much discussion with the villagers, it was decided to set up a small experiment on two holdings at Sangin Village opposite Danubyu. The cultivators were warned of the possibility of failure and, unfortunately, the results here were as unsatisfactory as those at Hmawbi. Wheat and gram were tried on small areas but neither succeeded.

25. The failure may be ascribed to:—

Causes of failure.

(1) Unsuitable soil. This was too stiff to get a seed bed suitable for wheat with the implements at command. In Europe a tilth is got on stiff clay by ploughing it when it is of a consistency resembling cheese. A heavy iron plough turns over a continuous furrow and each furrow is firmly "jammed" against its neighbour, the whole forming a compact mass. When this dries it is harrowed and, owing to the compactness and resistance of the furrows, only the top is broken by the harrow and thus a fair tilth is formed.

With the Burmese plough, however, no continuous furrow is got. The land is turned up in loose isolated lumps and, when an attempt is made to harrow these down, they are simply dragged by the implement across the field. Even the very heavy "Kyandon" which was experimented with, had little or no effect on them.

As to the question of introducing heavy iron ploughs, there is little possibility of that. In such soil it is doubtful if six pairs of bullocks could work such a plough which in the British Isles is usually drawn by a pair of powerful drag horses and, perhaps, by three in the stiff clay land.

(2) But, apart from the difficulty of cultivation, there is also that of water. In such soils it is evident that the rate of loss of water in the dry season, when no rain falls, must be very rapid, so that the roots of the young plants soon lose touch with the moisture parts of the soil. This will form an interesting chemical enquiry.

(3) There is also the question of temperature. A glance at a map shows one that the wheat belt of the world is in the temperate zone where the plant finds

its natural habitation. Attempts to grow wheat in Mexico have failed and, when wheat is grown in tropical or sub-tropical countries, a cold winter is necessary. In Upper Burma wheat is grown in the cold season when the temperature is lower than in Lower Burma and the soil retains more moisture.

For some reasons it is, perhaps, to be regretted that these experiments were undertaken. But the people thoroughly understood that they were experiments the chance of success in which was small: they were anxious to undertake them and will not be deterred from further experiments if we can recommend anything which we have proved elsewhere to succeed. These experiments, collateral with those at Hmawbi seem to have demonstrated fully the impossibility of growing wheat on paddy lands in the dry season in Lower Burma and this negative result is something. In future we shall only attempt with cultivators experiments the success of which we have proved at the Agricultural Stations.

Terraced cultivation of paddy in the Chin Hills.

26. In order to induce the Chins to adopt a less wasteful system of cultivation Mr. Street made proposals for the entertainment of two Angame Nagas to demonstrate the growing of rice on terraced land irrigated from the hill streams. The sanction of Government to an expenditure of Rs. 300 on this experiment was obtained: and a further grant has subsequently been made. So far progress, though slow, has been encouraging; but Captain Burne considers that this experiment should be secondary to the development of wheat cultivation and in this view I agree. He also considers that, even if successful, the method will not be popular with the ease-loving Chin on account of the labour it involves and proposes to stop the experiment now that the demonstration has been given. I think this suggestion also is sound and I have sanctioned his proposals.

Groundnut.

27. The cultivation of this popular crop has gone up, by leaps and bounds, during the year under report. The provincial total is 1,42,051 acres as against 78,743 acres last year. The crop has, thus, practically doubled. The most striking increase has been in Myingyan where the area has increased from 31,337 acres to 73,188; in Magwe it has risen from 42,542 acres to 54,900 and in the Lower Chindwin from 1,789 acres to 4,958. In Pakôkku, Myingyan and Meiktila efforts are being made to further the cultivation by the advance of seed through Government agency as Agricultural advances, the value being repaid at harvest. For the development of this scheme, which not only tends to the expansion of the crop but also affords a measure of relief to the inhabitants of the scarcity-stricken dry zone, credit is due to Mr. Mathews—at that time Commissioner of Magwe—and to Mr. Grant, I.C.S., Deputy Commissioner of Pakôkku. A note on the system was distributed to all Deputy Commissioners in districts liable to scarcity and action has been taken in Myingyan. Sagaing and Meiktila will probably adopt a similar plan in years of scarcity. A free distribution of 100 baskets was made in the former district this year and 600 baskets were sent to the Deputy Commissioner, Pakôkku, for issue on the terms described above.

Groundnut is essentially an Upper Burma crop though it also succeeds on the lighter soils of Lower Burma. Thus Toungoo and Bassein both report successes and the Arakan littoral would be very suitable if the cultivators were sure of immunity from floods.

The visit of Dr. Butler, the Imperial Mycologist, unfortunately confirmed the existence of the *tikka* disease: and the mills report a decrease in the outturn of oil from the nuts. To meet this, extensive experiments are being made at Mandalay with exotics to obtain, if possible, a better variety immune to *tikka* disease and a scheme for the establishment of Seed-Depôts for the distribution of selected seed of the best varieties is under discussion. Groundnut is undoubtedly the salvation of the dry zone but constant cropping tends to deterioration and, to stop this, rotations must be followed and seed changed. To both of these points we are directing our attention.

Wheat.

28. The shortage of the Burma wheat crop and the failure of experiments in its cultivation at Kēngtūng in the Southern Shan States were represented to the Department as matters of considerable economic importance and deserving of attention. The importance of developing this form of cultivation was impressed on the Deputy Commissioners of districts where the crop is grown. There is no evidence that there has been any expansion in the cultivation of this crop and, except in a few districts, the people seem rather averse from taking it up. As regards Kēngtūng, the Local Government have sanctioned the deputation of three Shan pupils to the Mandalay Agricultural Station to be trained in wheat growing. In the Chin Hills, however, the subject has been seriously taken up. Last year it was grown in 113 villages in the Falam Subdivision and 64 villages in Haka with considerable success and it has now been settled that the Military Police shall take over all available wheat at Rs. 3 per 60 lbs. The principal demand for an extension of cultivation is in those remote places where the rationing of the Military Police is rendered very expensive by the heavy cost of transport and strenuous efforts are being made to get a local supply. To this object Mr. Street and Captain Burne have devoted themselves with energy. The survey of the Burmese wheats is being continued on the Mandalay Agricultural Station and various small distributions of seeds have been made to Upper Burma Districts but without much result.

Tobacco.

29. Owing to the late arrival of the seeds from America no new experiments were made last year. The Deputy Director has been studying the tobacco question at Danabyu and we hope to introduce new method into experiments with it in the future.

Cotton.

30. Practically no exotic cottons were issued to districts during the year. It seems desirable that they should first be thoroughly studied and succeed on an Agricultural Station before we issue any to the public so that there may be a legitimate hope of success.

The survey of the Burmese cottons is being continued at Mandalay.

English Vegetable seeds.

31. The complaints that failures in the past have been due to lack of knowledge of the proper methods of cultivation have been met by the compilation of a series of simple leaflets which will accompany future issues of the seeds.

Miscellaneous.

32. Barley promises well in the Chin Hills; tea and coffee have been fairly successful especially in districts in the Northern Wet Zone.

As usual a large number of small distributions of particular seeds were made to various districts but none of the results are of sufficient general interest or on such a scale as to require detailed comment.

PART IV.

MISCELLANEOUS.

Work in the dry zone districts.

33. During the year I was directed by the Local Government to place foremost in my programme an investigation into the possibility of introducing and extending, in the dry zone, the cultivation of crops which do not require much rain. So far I incline to the view that the principal crop which can be economically grown in these districts is groundnut. Sessamum, however, being a very valuable and necessary crop, we are recommending the mixed sowing of sessamum and groundnut: if the former fails the chances are the latter will succeed. A village-to-village survey of these districts has been started with a view to ascertaining accurately their agricultural possibilities: the distribution of seed as agricultural advances is being extended; and the question of Seed-Depôts is being discussed.

Meanwhile the question of other drought-resisting crops is being investigated and the feasibility of ensilage as a provision of food for cattle will also be gone into.

Visit of the Imperial Mycologist.

34. Early in January Dr. Butler, Imperial Mycologist, visited Burma at my request to investigate the decay of the orange trees in Moulmein. He also inspected the sugar-cane cultivation of Thatôn and Kyauksè; the fruit cultivation of Maymyo; and ground-nut and cotton at Myingyan. His recommendations have not yet been received but will be communicated in due course.

Economic products.

35. A large number of products of economic value were collected during the year and forwarded to the Reporter on Economic Products, Calcutta.

The principal were: samples of the Dioscorea Birmanica: Sesbania grandiflora: Syderoxylon tomentosum: Siphonodon celastrinens: Spatholobus Roxburghii: Gynandropsis pentaphylla: Stephegyne pensifolia: Stephegyne diversifolia: nux vomica and V. spinosa.

My thanks are due to District Officers for help in making these collections. They will have a greater interest when we have a Botanist who can identify them locally. A report on Native Pens was sent to the Reporter on Economic Products to enable him to complete his enquiry on the subject. Mr. Burkill's classification of the Burmese Peas and Beans is nearly complete and the further information required is now being collected.

Agricultural and Live-Stock at Bhamo.

36. The only show held during the year was at Bhamo: it being deemed inadvisable to hold shows at Mandalay or Hmawbi till the farms are fully equipped. The Bhamo Show, which was visited by Colonel Evans, Mr. Thompstone and myself, was held on the 28th and 29th of March. On the whole it was an improvement on last year's Show. Buffaloes were excellent in quality: the oxen, though small, included many animals of good stamp: and ponies, though poor, were superior to those exhibited in 1907. The produce classes were again excellent. The statement below shows the expenditure on this Show.

Provincial Grant.	Prizes.	Contingencies.	Total.
1	2	3	4
Rs.	Rs.	Rs.	Rs.
1,745	1,147	591	1,738

A grant of Rs. 300 was also given to the Mandalay Horse Show.

Agricultural Education.

37. During the year the courses of instruction for the Subordinate Staff referred to in paragraph 35 of last year's Report were delivered. Owing to the want of suitable buildings the work had to be carried out, under very unfavourable circumstances, in one of the temporary godowns attached to the farm. In addition to the regular staff of the farm, for whom the course was compulsory, a large number of volunteer students took the course: the maximum attendance being 36. Beyond an elementary introduction into the scientific aspect of agriculture the course has been useful in enabling us to determine what standard of education will be necessary for a proper appreciation of the lectures and also in fixing the standard for the more elementary and special courses. Proposals have been submitted for starting the Three Years' or Diploma Course in November, and a complete scheme for the development of the Department and the utilization of the College has been framed and will be submitted in the course of a few days.

In April Messrs. Thompstone and Shroff, at the request of the Inspector of Schools, Northern Circle, gave a short course of lectures on elementary Nature Study to the Normal Teachers and Deputy Inspectors of Schools who were assembled for the Annual Report. Arrangements are being made to continue this course on a fixed plan.

38. During the year considerable correspondence has taken place with the Director of Public Instruction as to the revision of Agricultural lessons in School-books and I have been asked to act as an Honorary Member of the Committee for the revision of vernacular readers. The Departments of Education and Agri-

Agricultural School Books.

culture are co-operating cordially in the attempt to improve the agricultural and general scientific teaching in the Province and are each rendering willing assistance to forward the other's aims.

Under the supervision of Mr. Thompstone a considerable mass of material has been compiled for inclusion in school books or Agricultural Readers, and this work will be continued.

39. During the year Mr. Warth has compiled a set of Climatological tables

Publications.

and Charts for some of the principal districts of Burma giving details of rain-fall, temperature, etc., which, it is hoped, will be of use to intelligent agriculturists and to the Department. The compilation has been approved by Dr. G. T. Walker, F.R.S., who has no objection to its publication. The exact form in which these tables will be published has not yet been decided on. Mr. Sawyer has also compiled a Bulletin on Lemon grass but, as the cultivation of this plant for oil extraction cannot, at the present time, be economically recommended, its publication has been deferred. The following Cultivator's Leaflets have been issued during the year:—

No.	Subject.	Author.	Languages.
1	2	3	4
1	Wheat cultivation ...	Mr. Thompstone, B. Sc. ...	English, Burmese, Karen and Shan.
2	Chafers and Chafer Grubs ...	Do. ...	English, Burmese and Karen.
3	Farm Yard Manure ...	Do. ...	Do.
4	Groundnut	Do. ...	English, Burmese, Karen and Shan.
5	Red Rot Disease of Sugar-cane	Dr. E. J. Butler, Imperial Mycologist.	English, Burmese and Karen.
6	Introduction of Moulmein paddy into Akyab.	Mr. J. MacKenna, M.A., I.C.S.,	English, Burmese and Bengali.

The interest which has been aroused by these leaflets exceeds all expectations. We can hardly meet the demand. Revenue Surveyors and Settlement Holding Markers can increase their utility by reading and explaining them to villagers. My thanks are due to missionaries of all denominations for their intelligent circulation of these leaflets: especially to the Reverend Messrs. Seagrave and Marshall, of the American Baptist Mission, who have kindly arranged for their translation into Karen.

40. During the year I had a visit from Professor Kikkawa of the Imperial

Visits.

University of Tokio, Japan. He visited the Mandalay Agricultural Station and I have arranged for the supply to him of various seeds. We also had a visit of Messrs. James Ryan and

F. Crosbie Roles from Ceylon who had been deputed to enquire into the possibility of a trade in "parboiled" rice from Burma to Ceylon. They were given all information available and I am awaiting details of the particular experiments they wish us to make.

Collections sent out of Burma.

41. Samples of Burma wheat were sent to the Secretary for Agriculture Salisbury (Rhodesia) and of Hill Paddy to Valencia, Spain. Samples of Rangoon beans and of indigenous tobacco were also sent to the Inspector-General of Agriculture.

Miscellaneous.

42. The Quinquennial Return of Crop Measurements by District Agency was submitted during the year. Proposals for an alteration in method so as to render the results more useful to Settlement Officers have been circulated for opinion. The replies are not yet complete.

Conclusion.

43. The most gratifying feature of the past year has been the increased interest taken in the doings of the Department both by Government officials and by the general public. From the latter I have received in my own office from private cultivators about 100 enquiries: while other members of the staff have had numerous references direct to them. The correspondence in my office has trebled during the year of Report. The Department is now prepared to advise on all matters connected with Agriculture, Agricultural Chemistry, Botany or Entomology and welcomes all enquiries addressed to it. In particular it solicits the interest of all Deputy Commissioners and Subdivisional Officers in questions of agricultural importance within their charges and will welcome any proposals for experiment which may be suggested. For valuable suggestions during the past year I would express my particular obligations to Mr. Clayton, Deputy Commissioner, Ma-ubin, and Mr. Grant, Deputy Commissioner, Pakôkku, and to Captain Sandeman when Subdivisional Officer of Amarapura. The agricultural prosperity of the country is the surest guarantee of peace and content and I trust that all officers will cordially co-operate with us in our efforts to obtain that prosperity. "For" (to quote His Honour the Lieutenant-Governor) "in the fields and villages are bred the homely virtues which make the people of Burma among the happiest in the world."

J. MACKENNA,

MANDALAY, 10*th August* 1908. *Director of Agriculture, Burma.*

APPENDIX.

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STATEMENT I.—Receipts and expenditure of experimental cultivation during the year 1907-08. 15

STATEMENT) I.—*Receipts and Expenditure of Experimental Cultivation during the year 1907-08, exclusive of the Agricultural Stations, Mandalay and Hmawbi* (Paragraph 21).

No.	Stations.	Budget allotment.	Receipts from sale of produce.	Expenditure.						
				Establishment.	Purchase of seeds.	Upkeep of garden.	Feed and keep of stock.	Miscellaneous contingencies.	Purchase of live-stock and agricultural implements.	Total.
1	2	3	4	5	6	7	8	9	10	11
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Bhamo (Sinlumkaba) ...	1,785	90	1,313	44	...	...	2	...	1,359
2	Chin Hills (Falam) ...	1,360	288	720	410	202	...	75	...	1,407
3	Katha	1,850	278	1,200	...	...	...	306	...	1,506
4	Myitkyina (Myitkyina and Sima).	2,009	234	1,056	106	242	...	3	15	1,422
5	Southern Shan States (Taunggyi).	4,646	649	3,128	167	...	...	142	371	3,808
6	Distribution of seeds from Headquarters.	5,000	...	...	3,293	...	...	...	...	3,293
7	Distribution of Agricultural implements.	500	...	...	...	...	...	...	...	...
8	Sericulture	1,000	...	...	...	...	...	...	...	...
	Total ...	18,150	1,539	7,417	4,020	444	...	528	386	12,795

G. B. C. P. O.—No. 27, D. of A., 1(b), 19-11-1908—352—A. D. C.

REPORT

ON THE OPERATIONS OF THE

DEPARTMENT OF AGRICULTURE

BURMA

For the year ending the 30th June 1909

RANGOON
OFFICE OF THE SUPERINTENDENT, GOVERNMENT PRINTING, BURMA
1909

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From J. J. ANDERSON, Esq., B.A., I.C.S., Assistant Secretary to the Financial Commissioner, Burma, to the Revenue Secretary to the Government of Burma,—No. 1360—5R.-97, dated the 25th September 1909.

I am directed to transmit the report on the operations of the Department of Agriculture for the year ending the 30th June 1909.

2. The financial stress has somewhat curtailed operations and it is to be hoped that when funds permit the farm at Hmawbi will be opened to conduct experiments in the cultivation of paddy, more particularly with the object of arresting the rapid deterioration of the soil which is evident from all Settlement Reports. The cultivation of "green manure" crops appears to be the most hopeful remedy and might be encouraged by a lower rate of assessment on land so utilized.

3. It is impossible to over-estimate the importance of teaching Kachins to terrace properly, and of inducing them to grow new crops. If they could grow sufficient paddy for their own consumption on terraced areas, and raise a crop valuable in proportion to its bulk to supply them with money to enable them to purchase other necessities such as salt and the amenities of life the wholesale destruction of forests might receive a check At present there is pressure of population on cultivated area in the Kachin Hills, and from reports it is evident that only the excess population descends to the plains. The general question is receiving attention as the damage caused by the denudation of forests is by no means confined solely to the area over which it takes place.

4. The abandonment of the Katha garden has the entire approval of Mr. Todd-Naylor though at first as Commissioner, Mandalay Division, he was disposed to maintain it.

5. The experimental introduction of the new variety of paddy into the Akyab District is interesting and it would appear that the chief obstacle to improvement is the apathy and dishonesty of the people who cultivate in a slovenly fashion and habitually water the paddy brought in for export.

6. Cultivation of *Tadaungbo* paddy is on the increase. The recent floods caused by the bursting of the Pagaing bund ruined all the paddy crop except the *Tadaungbo* variety some of which was saved. This should increase its popularity. It can be grown apparently in any depth of water so long as there is no current. Flowing water is fatal to it. Early ploughing and planting greatly contribute to its success in deeply flooded areas.

7. The failure of the experiments with tea, alluded to in paragraph 24, is disappointing. Mr. Todd-Naylor believes that the seed of the indigenous tea tree is necessary for new cultivation and should be obtained from the Palaungs if the experiments are continued.

8. The attention of the Director of Agriculture has been drawn to the dangerous weed which is spreading rapidly through Myingyan and attacking *jowar*. It is a plant with a small white flower locally called *Pwinbyu* or *Pyaungsabin* and is similar to a parasitic plant which is fatal to sugarcane.

Mr. Todd-Naylor is personally cognizant of the damage it has wrought and the extent to which it has spread in Myingyan District. The simple remedy of cropping the land for two or three years in succession with ground-nut or sessamum is advocated.

9. Agricultural "Shows" do not appear to be worth the money actually spent on them. They might be more successful if held at the same time as a local festival which itself attracts people.

10. The Officiating Financial Commissioner is glad to note the interest taken in Agricultural questions by the officers mentioned in the report. It is essential for the success of the Agricultural Department that it keep in close touch with the District Officers.

11. The records of experiments conducted and of bulletins issued, show that the Director and his staff have not spared themselves either in office or in the field, and they are to be congratulated on the progress achieved by them.

REPORT

ON THE

OPERATIONS OF THE DEPARTMENT OF AGRICULTURE, BURMA,

For the year ending the 30th June 1909.

PART I.

ADMINISTRATIVE.

Personal.

1. Mr. J. MacKenna, M.A., I.C.S., was in charge of the Department until the 15th June 1909, when he proceeded on short leave. For the remaining 15 days of the year of report I held charge.

Tours.

2. During the year 180 days were spent by the Director on tour and the following districts were visited, namely, Akyab, Prome, Bassein, Myaungmya, Thatôn and Amherst in Lower Burma; and Mandalay, Katha, Shwebo, Magwe, Minbu, Pakôkku, Meiktila, Myingyan and Kyauksè in Upper Burma. He also accompanied Mr. I. H. Burkill, M.A., Reporter on Economic Products to the Government of India and Mr. J. W. Mollison, M.R.A.C., Inspector-General of Agriculture in India, on their tours in the Province. Mr. Burkill visited Burma in December last in connection with his investigations on the subject of Burmese peas and beans. The Inspector-General during his visit in January enquired into the silk-weaving industry of Amarapura, sugar-making in the Kyauksè and Thatôn Districts, garden and fruit cultivation at Maymyo, cotton and groundnut milling in Myingyan and rice milling in Moulmein. He also inspected the Government experimental garden at Katha, the discontinuance of which he recommended, mainly on account of the difficulty and expense of obtaining the efficient water-supply which is absolutely essential to the establishment of exotic fruit trees, but also on the ground that the Department has not, in its present stage of development, men sufficiently trained to give adequate supervision to such work.

The Inspector-General also visited the garden of Government House at Maymyo, and those of the Agri-Horticultural Society of Burma at Rangoon, and in company with the President of the Rangoon Municipality, the various slaughter-houses under the charge of the Municipal Veterinary Officer.

Temporary limitation of the scope of the Department.

3. The visit of the Inspector-General afforded a suitable opportunity for considering the position of the Department with reference to the present stage of the development of the Province and the financial exigencies of Government. With regard to the various Agricultural Stations, acquired or proposed, Mr. Mollison thought that the equipment of the Mandalay Station, which is the headquarters of the Department, was suitable, but urged the necessity of limiting actual experiment to the extent which the trained staff is capable of supervising. As a larger trained staff becomes available the range and scope of experiments might be extended, but at the outset the bulk of the land should be cultivated non-experimentally or for the production of seed for which there is a demand.

At Hmawbi, where a large area of land has been acquired, and at Meiktila, where a site for the station has been selected, the Inspector-General considered that only the area necessary for actual experiment should be worked at the start, the remainder being let out to ordinary cultivators, but to be available for further expansion of experiment or seed production as the Department grows.

After considering proposals on these subjects, the Local Government has decided that, while the Mandalay Station should continue with its present establishment, the interests of economy do not permit of a farm being started at once either at Hmawbi or in the dry zone. All the land acquired at Hmawbi has therefore been leased out to cultivators, and the project of a farm at Meiktila has been abandoned for the present.

The most important question discussed during the visit of the Inspector-General was, however, the advisability of deferring the constitution of an Agricultural College. As a result, it has been recognised that the time is not yet ripe for such an institution in Burma. While the general standard of vernacular education in the Province is remarkably good, the higher English qualifications which would be necessary for the appreciation of a course of scientific education are very rare. It is improbable that students would be attracted simply by a desire for agricultural training; and attendance would be limited to those who were anxious to obtain employment in the Department. This being so, it seems more expedient to limit work at the outset to experiment on the farm and the training of Burmese field assistants. The next step will be a Vernacular School to train actual cultivators; later, with the general advance in education, the idea of a college may be revived. These views were submitted to the Local Government, and their orders deferring the constitution of the Agricultural College have been received.

Expert Staff. The Agricultural Botanist.

4. It was decided in the autumn of 1908 to appoint Mr. E. Holmes-Smith, B.Sc., to the vacant post of Agricultural Botanist. He arrived in India early in October, and was posted to Pusa for training under the Imperial Economic Botanist at the Research Institute. Intimation has, however, now been given that owing to financial pressure, the post will not be filled at present, and Mr. Holmes-Smith will be appointed temporarily to some Province in India other than Burma.

Principal of College.

5. Mr. Thompstone, B.Sc., was in charge of the appointment of Principal of the College throughout the year, and was occupied principally in conducting the Mandalay Agricultural Station. The experimental garden at Katha was also under his charge. He drew up a syllabus of the courses of instruction to be given at the college when opened, worked out other details of its administration and instructed the subordinates of the farm in practical work and in the method of conducting experiments. In addition to work on the farm, Mr. Thompstone commenced surveys of the varieties of wheat and paddy in Burma, which are now being continued by the Assistant Botanist under his supervision. He is at present engaged in the description and classification of the various kinds of cotton, jowar, peas and beans grown in the Province, and in the study of foreign groundnuts with a view to finding a variety more profitable than that commonly grown. Although the Mandalay Station is still in its intitial stages and cannot be left in charge of the subordinate staff for more than a few days at a time, the Principal was able to make occasional short tours. He visited the Katha garden five times; accompanied the Director in his enquiries at Maymyo and the neighbourhood regarding *taungya* cultivation and the possibility of starting a fruit farm; toured in the Ruby Mines District for the purpose of inspecting and reporting on flooded lands; attended the Agricultural Conference at Nagpur and on the way visited the show at Rangoon of the Agri-Horticultural Society of Burma; enquired at Bhamo into the possibility of improving Kachin agricultural methods so as to reduce the area denuded by *taungya* cultivation, and visited parts of the Shwebo and Mandalay Districts to give instructions for growing groundnuts and arrange the distribution of seeds. He also judged the exhibits in the fruit and vegetable sections of the Bhamo show in March last. Mr. Thompstone superintends the work of the Assistant Botanist and the Assistant Entomologist, and a considerable part of his time is taken up with administrative details, the distribution of seed, the preparation of notes in answer to enquiries on agricultural matters and the collection and despatch of specimens.

The Deputy Director of Agriculture.

6. As the Hmawbi Agricultural Station was closed throughout the year, Mr. A. McKerral, M.A., B.Sc., was engaged in district work only, with occasional periods of supervision of the Mandalay farm. From July to October he made an agricultural survey of the Myingyan District and personally instructed cultivators in improved methods of tillage. In December he accompanied the Principal of the College on his tour to the Ruby Mines District. In January he visited the Yemyet In in the Sagaing District with a view to deciding on the possibility of initiating there a process of *bonificazione*. The remainder of January and February were occupied by a visit to the Chin Hills in connection with the growing of wheat for the Military Police. In March and April Mr. McKerral accompanied the Director on a tour to Akyab, undertaken with the object of fostering the introduction of Moulmein paddy; and in May he investigated at Ma-ubin the possibility of starting an industry there in plantain fibre and visited certain land at Pyalo in the Thayetmyo District concerning which advice was asked for by the Deputy Commissioner.

The Agricultural Chemist.

7. Mr. F. J. Warth, M.Sc., has now succeeded in bringing the chemical laboratory into an efficient state, and an excellent beginning has been made in the work of this branch. Extended enquiries have been undertaken in connection with silt experiments, the manurial requirements of paddy and the chemical classification of soils of the Meiktila District and of the Mandalay farm; special analyses of soils, manures and agricultural products have been made; and certain miscellaneous experiments have been carried out. Experiments on the utilisation of river silt on the lines of Sir Edward Buck's proposals are in progress at the Mandalay farm. As a preliminary measure towards testing the manurial requirements of paddy, analyses of the ash of selected varieties have been made. Mr. Warth visited Mahlaing in order to confer with Mr. W. J. Keith, M.A., I.C.S., Settlement Officer, Meiktila, on the subject of soil analyses, and the conference resulted in the undertaking of a joint enquiry, which is still proceeding, on the possibility of ascertaining the comparative fertility of soils by simple methods of mechanical analysis. A detailed analysis of soil samples from each section of the Mandalay farm is being carried on. The object of this work is to secure accurate data regarding the present fertility of the land and so to render it possible at any future date to gauge the effect upon the soil of each cropping scheme. Soil samples from Rangoon, Shwebo, Kyaikto, Hmawbi, Akyab, Pyalo (Thayetmyo District) and Sagaing have also been examined. Twenty-one sorts of manures were analysed and the results obtained in the case of local limestones have proved of especial interest and value. Mr. Warth also tested several samples of drinking water and ascertained the oil content, by various methods of extraction, of several varieties of groundnuts. The miscellaneous experiments included the disproof of the commonly received idea that sessamum and groundnut oils decompose when mixed. Beside his tour to Mahlaing, Mr. Warth visited Hmawbi, Maymyo and Prome during the year.

The work of the Chemist was hampered by the absence of a road to the laboratory and of quarters near his work. The former difficulty has now been removed but the latter still exists and is a serious drawback in the conduct of experiments which cannot be begun and ended within office hours.

Subordinate Scientific Staff.

8. The subordinate scientific staff consists of the same officers as last year, with the addition of two assistants who have been appointed on probation in the chemical branch with effect from the 1st April 1909. It is an encouraging fact that these assistants are Burmans trained by Mr. Warth and that they show distinct promise.

Mr. D. B. Darabsett, B.Sc., Bombay, Chemical Assistant, joined his appointment on the 3rd July 1908, and has assisted Mr. Warth generally throughout the year.

Mr. Shroff, the Entomological Assistant, has systematically carried on field work in the country round Mandalay. He classified a large number of injurious insect pests, and studied their life histories by actual rearing. Experiments for the destruction of some of them were conducted on the farm. Mr. Shroff made a particular study of the pests of the cotton crop, and for this purpose visited the Lower Chindwin, Sagaing and Myingyan Districts. He also undertook an examination of fruit flies at Maymyo, and advised on a number of entomological references received from districts. During the year many specimens of diseased plants and insects were collected and sent for identification to the Research Institute at Pusa.

Mr. Sawyer, the Botanical Assistant, continued the wheat and paddy surveys which had been started by the Principal of the College; and assisted in the preparation of notes on foreign varieties of groundnuts grown on the farm, and in the botanical study of Burma varieties of peas and beans. He instructed Shan students from Kēngtūng in botany and the growing of wheat, and was in charge of the exhibit sent by the Department to the Agri-Horticultural Society's show in Rangoon. A few specimens of plants and fungi were received for identification from the districts, and advice was given on the distillation of camphor and lemon grass oil among other subjects. Mr. Sawyer made frequent excursions in and about Mandalay and a few more extended tours, principally for the purpose of collecting specimens of plants and products of economic value which he has prepared for future use.

9. The only new work completed during the year was the strengthening of the fence round the agricultural station at Hmawbi.

Buildings.

The grounds round the Mandalay buildings are being laid out and planted with trees under the supervision of the Principal of the College. The office of the Director of Agriculture, though not yet quite completed, is being used as a laboratory for botanical, entomological and agricultural work, and has been temporarily fitted with a few work tables and benches. An estimate for interior roads at the farm at Mandalay has been sanctioned. The question of constructing these roads and of providing a road from the Director's office to the farm buildings, quarters for peons and menials near the chemical laboratory, and a water-supply for the buildings at the farm is under consideration. In view of the importance of these works in the management of the station, it is hoped that a favourable decision may be found to be feasible.

PART II.

AGRICULTURAL STATIONS AND EXPERIMENTAL GARDENS.

10. Mandalay remains the only Agricultural Station and a report by Mr. Thompstone on its administration is printed as an Appendix to this Report. The farm was visited during the year by the Financial Commissioner. Financial pressure will not permit of operations at the Hmawbi Station or of a station at Meiktila being acquired. With the reduction of the superior staff this temporary limitation is not so much to be regretted as it otherwise might be, but an Agricultural Department which has not facilities for dealing in Lower Burma with the main crop of the country, namely, rice, can hardly be considered well equipped.

Number of Stations.

11. It was proposed in 1908 to establish near Maymyo a central garden for experiments and demonstrations in the growing of exotic fruits and flowers and the gradual introduction of exotic crops which often cannot at once be grown in the plains, but might be successfully cultivated there after a gradual acclimatisation. But on further consideration, the project was deferred on the ground that there are few places in Burma similar to Maymyo in climate. Any results obtained could not therefore be expected to be of wide application. Much is being done by private agency in

Experimental Gardens.

the experimental cultivation of fruits and flowers, and for the dissemination of those that will grow generally throughout Burma, the Agri-Horticultural Society of Burma at Rangoon seems a suitable agency.

The Katha garden was closed at the end of April last. The gardens which are now in existence are therefore those at Sinlumkaba in the Bhamo District; Myitkyina; Falam, Tiddim and Haka in the Chin Hills; and Taunggyi in the Southern Shan States.

Sinlumkaba, Bhamo District.

12. As foreshadowed in last year's Report, the scheme of the Sinlumkaba garden has been considerably revised. The objects of the garden now are:—

(i) the cultivation of cereals superior in outturn and value to hill-paddy;

(ii) the encouragement and extension of the existing system of permanent terraced cultivation; and

(iii) the instruction of the pupils of the Government school in agriculture and horticulture.

Experiments in the terraced cultivation of wheat and oats were carried out during the year both in the Government garden and at certain villages under the supervision of selected headmen. For a first experiment the results were fairly successful. A number of the villages were visited by the Deputy Commissioner, Mr. G. W. Dawson, Mr. Thompstone and Mr. Rae during March, and arrangements were made for more extensive and thorough experiments next season. In the garden proper a certain amount of English vegetables are still grown by the pupils of the Government school, who also consume them. The school numbers 40 pupils, and arrangements are being made to give the boys a practical agricultural lesson at least once a week.

During the year the fruit trees still in the garden were dressed with farm yard manure, and the roots of some of the older trees were opened out. Several of the apple and pear trees fruited for the first time. The pears are of good size and fair quality, and an attempt will be made to place the fruit on the Mandalay market. Mr. D. W. Rae, to whom thanks are due for the keen interest he takes in the agricultural concerns of his charge, is sanguine that the cultivation of such hardy fruits as apples and pears will, in the course of time, prove remunerative and he has enlisted the aid of two Roman Catholic missionaries stationed at North Hoton and Matin in his experiments with fruit trees and cereals. The garden was inspected by the Principal of the Agricultural College.

Myitkyina.

13. During the year a well was constructed in the new portion of the Myitkyina garden. The stocking of this part of the garden with various varieties of peaches and plums raised from local stock has been proceeded with. Lichees are reported to be doing well, and peaches and loquats are firmly established. About 150 young plants of shade trees have been distributed throughout the district for planting by the road sides. This is a useful purpose to which part of the garden can be devoted. On the new part of the garden barley and oats were tried. The former produced a very satisfactory crop. Experiments with cereals will be continued.

The receipts from the garden have fallen off this year owing to the extension of market and fruit gardening in and around the town of Myitkyina, with the result that prices have dropped through competition. This is indirect evidence that the efforts of the Government garden have not been in vain.

Chin Hills.

14. Owing to the interest taken in the work by the Headquarters Assistant, the vegetable garden at Falam, which during the earlier part of the year supplied vegetables in but meagre quantities, has been brought into a satisfactory state. English vegetables of excellent quality are now produced. Attempts are being made by the Superintendent to extend the cultivation of potatoes and onions among the Chins themselves, and seeds were issued by the Assistant Superintendent, Haka. The

experiment, however, met with little success. At the Haka garden the supply of vegetables was plentiful and continuous. In the beginning of the year the garden at Tiddim was not doing well and the yield was scanty. The site was changed with good results and more vegetables are now being produced.

The cultivation of fruit trees in the Chin Hills was attended with partial success. Peach trees bear well at Falam, but the fruit is either blown off the trees by high winds or rots before it has had time to ripen. Although the supply of peaches at Tiddim is plentiful, it is of very inferior quality. The cherry and nectarine trees in the Hills seldom bear any fruit though they look flourishing. Apples do well at Haka and so do plums at Falam; but at Tiddim both produce small fruit. The Assistant Superintendent at Tiddim has begun experiments with cuttings from the apple, plum and apricot trees, and some of them have rooted and are doing well. An unfortunate attack of grubs did much damage to the strawberries in the Falam garden.

The Falam and Haka gardens were inspected by the Deputy Director in the month of February.

Katha.

15. The Katha garden was taken over by the Department in March 1908, but a six months' trial proved that the new arrangements could not be satisfactorily carried out. Properly trained men could not be obtained as gardeners, the site was unsuitable, labour expensive, and the hopeless condition into which the fruit trees had been allowed to drift rendered it imperative for success to obtain an entirely new stock, at an expense which the utility of the garden could not warrant. In consequence, the garden was abandoned in the spring of this year after a season spent in trying to get it into order.

Taunggyi, Southern Shan States.

16. Work at the Government Orchard at Taunggyi has been handicapped by the absence of a competent Superintendent. Since the services of Mr. Colyear were dispensed with, the head gardener, Maung Se, has been in charge and, although he has shown great aptitude, he is unable, through ignorance of English, to go beyond what he has been taught. Mr. H. W. A. Watson, Deputy Conservator of Forests, has, however, very kindly taken an interest in the garden and has supplied an instructive report on its working during the year. Much damage was caused to experimental crops by attacks of insects which were unusually prevalent owing to the early advent of the rains. Cotton and tobacco yielded only poor returns and the varieties of clover sown are unable to contend against the grass and weeds and, unless constantly cared for, are soon killed out. The older coffee shrubs yielded a considerable quantity of berries, but late transplanting and insufficient watering accounted for the failure of the tea trees that were put out at the close of last rains. Experiments with local and Pindaya pine-apples give promise of success.

Of the fruit trees, the tree tomatoes are the most successful. As in the Chin Hills, cherries look healthy, but show a tendency to abstain from fruiting, and though peaches fruited well they did not ripen properly and were of inferior quality. The climate does not seem to suit imported apples, but some of the pear trees are heavily laden. Want of water in the dry weather is much against the success of orange trees, and they bear small and poor fruit; and the plum trees also have produced only a few sour and indifferent plums. Some improvement in fruit culture might be effected by root pruning which has not been attended to for some years, although branch pruning has been regularly done. Trees in nurseries were grafted upon and did well, and the following are now available for sale :—

Apple	500	Peach	300
Pear	500	Cherry	500

During the year two probationers were permitted to return to their respective States after the expiry of their courses of training, and only one probationer now remains.

17. The total expenditure under all heads on the maintenance and up-keep of the gardens, amounted to Rs. 9,351, and Rs. 1,093 was realised from sales of produce. The nett Government expenditure was thus Rs. 8,258, or Rs. 295 more than in the previous year.

Financial aspect.

PART III.

EXPERIMENTAL CULTIVATION THROUGH DISTRICT AGENCY, DISTRIBUTION OF SEEDS, ETC.

18. An account of the results of the first year of experimental cultivation of moisture-resisting varieties of Moulmein paddy in the Akyab District will be found in paragraphs 22 and 23 of last year's Report. The imported variety has become very popular and the people are anxious to retain and distribute seed grown from each year's crop, but a slight deterioration in the quality of the grain has unfortunately occurred in consequence of the exceptionally careless methods of cultivation of the Arakanese. Last season a few boat loads of the new paddy reached the European mills where it was regarded as much superior for milling purposes to the local Necranzie, and it is thought that even with the system of watering to which it has already been subjected, it will be possible, as its cultivation spreads, to obtain cargoes of milled grain suitable for export to Europe.

Introduction of "moisture-resisting" paddy into the Akyab District.

The results of the sowings of moisture-resisting paddy have been carefully watched by the Land Records staff. In March the Director toured in the Akyab District to see what further action, if any, was necessary in connection with the furthering of its introduction. It was found that it was on the way to becoming firmly established and direct intervention will for the present be discontinued. Later it may be possible to do something in the way of demonstration of better methods of cultivation and in growth and distribution of selected seed.

19. The variety of paddy known as *tadaungbo* having succeeded on lands in the Ma-ubin District too deeply flooded to grow ordinary paddy, was tried on the riverine tract of the Ruby Mines District and in Thatôn and the Upper Chindwin. The experiments were not very successful owing to too late sowing but they are being continued. It has recently been reported from Ma-ubin that the crop quickly exhausts the soil, whether owing to the length of its stems, the small quantity of silt deposited by the flowing water in which it is planted, or the insufficient aeration of the soil. Early ploughing and green manuring with Sunn hemp have been suggested as remedial measures.

Tadaungbo paddy.

20. The most noticeable feature in connection with wheat cultivation is the increase which has taken place in the outturn of the Chin Hills. By the middle of May 172,000 lbs. had been brought in for sale to the Military Police, and it is estimated that the crop will total 200,000 lbs. against 75,000 lbs. in the previous year. This gratifying result is due to the efforts to extend cultivation made by the Superintendent and the officers serving under him. In view of the economic importance of ensuring the continuance of a local supply of wheat to the Military Police in this remote locality, the Deputy Director visited the Chin Hills and investigated on the spot the means of removing disadvantages arising from continuous cropping of the same ground and the insufficiency of the supply of manure. He recommended the selection of several pieces of ground for wheat at each village so as to render possible fallowing or the rotation of wheat with other crops; the connection of each plot with a water-supply; the terracing of plots situated on slopes; the trial of fertilising crops both as green manure and as rotation crops; and the collection of leaf compost as manure. Several plots suitable for wheat cultivation were selected personally by Mr. McKerral.

Wheat.

A good deal of damage was done to wheat in the Southern Shan States by the abnormal rains in November last. The latest information from Kēngtūng, however, indicates that the crop was up to the average throughout that State and good in the Ahka circles. The quality of Shan States wheat has been well reported on by millers in Rangoon, and it is therefore being tried at Mandalay to see whether it deteriorates or not in the climate of the plains.

Wheat experiments succeeded well at Sinlumkaba and moderately in the Lower Chindwin District, but no great advance in the cultivation of the crop has been made in the plains. A survey of the wheats of Burma was commenced a little over a year ago and a preliminary report is under preparation. Only a very few distinct varieties will probably be found to be grown in the Province.

Groundnuts.

21. The popularity of groundnuts has continued to advance rapidly, and the area under the crop has again practically doubled, the total acreage being 248,477 against 142,051 in 1907-08. The premier place, both as regards the area under the crop and the rate of expansion, is once more taken by the Myingyan District with a total area of 116,128 acres and an increase of 42,940 acres over last year's figures. But remarkable progress has also been made in Pakôkku, where the area under groundnuts in 1908-09 was 30,584 acres, in Magwe where it was 58,344 acres, and in the Lower Chindwin, Meiktila and Sagaing Districts, with acreages of 17,090, 9,471 and 8,508 respectively. The large increase in Pakôkku is due to the arrangements made to provide seed through Government agency as agricultural advances, which proved entirely successful notwithstanding a serious deficiency in rainfall at a critical period. Colonel Cronin is making arrangements for a trial next year of the system of seed advances on an extensive scale in the Lower Chindwin District. It is not certain yet whether groundnuts will succeed or not in the Arakan Division where its introduction was suggested by the Commissioner. Inundation destroyed an experimental crop in the Sandoway District, but another trial is being made this year in Kyaukpyu and should furnish more reliable results. The crop has not made much progress in Lower Burma owing to the general unsuitability of the soil. In Bassein its cultivation as a fertilising agent has been abandoned in favour of Sunn hemp and the trial at Ma-ubin resulted in failure.

Experiments with exotics and a study of all available varieties are being continued at Mandalay, in order to obtain, if possible, a variety immune from *tikka* disease, and to ascertain the relative yields of oil of different sorts. By way of inducement to cultivators to try the crop in the Mandalay and Shwebo Districts, the Department has undertaken to find a market for the produce, and has recommended the remission of revenue during the first years on land under groundnuts.

Cotton.

22. The general unsuitability of the Lower Burma soil and climate for cotton has again been indicated by the failure of various kinds of American and Egyptian cottons supplied for experiment on a small scale at Prome and near Rangoon. It is, however, an interesting fact that a sample of long stapled Pernambuco cotton grown by Miss Haswell on her plantation in the Amherst District was awarded a Diploma of Honour at the Indian section of the Franco British Exhibition, 1908. Unfortunately Miss Haswell has been obliged to abandon this plantation owing to difficulty in securing labour. Seed supplied by her for trial on the Mandalay farm failed to germinate. Before attempting to introduce exotics in Upper Burma, efforts are being directed towards a thorough examination of the varieties now grown with a view to ascertaining the possibilities of improvement by utilising the best of them. A variety found in the Northern Shan States has obtained a very favourable report from a Bombay firm and it is now being tried at the Mandalay Agricultural Station.

Tobacco.

23. Forty-five pounds each of Virginia and Havana tobacco seeds were distributed for experimental cultivation among twenty districts. The results reported up to now have been generally discouraging. Many failures were caused by the abnormal rains in

November and where, as in Minbu and Prome, the crop did well, difficulty was experienced in finding a market. Local varieties seem to be preferred by buyers.

Miscellaneous.

24. Sunn hemp was tried in a few districts in Lower Burma with varying fortune. Judging from the number of applications for seed and instructions the cultivation of jute has aroused considerable interest, but until the possibility of growing it profitably has been practically demonstrated, the Department will not be in a position to recommend this crop. It is being tested at the Mandalay farm. A small plot of oats succeeded at Sinlumkaba; with this exception, the results of experiments with oats and barley were not encouraging. Arabian coffee seeds were distributed in ten districts, but few successes have been reported. Experiments with tea also failed owing to the seed obtained from Bengal having been bad. English vegetable seeds yielded well where not spoiled by the late rains or through the ignorance of the cultivators. Some rain trees grown from seed supplied to the Deputy Commissioner, Sagaing, are doing excellently. The method of nursing young trees in Sagaing in pots buried in the ground up to the rim is interesting and perhaps unique in Burma.

PART IV.

MISCELLANEOUS.

Work in the dry zone districts.

25. The agricultural survey of the Myingyan District has been completed by the Deputy Director of Agriculture, and the result is a comprehensive account of the agricultural conditions of the district which will be of great assistance in judging its requirements and possibilities. When the same has been done in other districts in the dry zone we shall have some useful data on which to consider the feasibility of introducing new crops and extending the cultivation of those which exist. It will take some years to test the value of various crops which have up to now been suggested as drought resisters, and the decision on financial grounds not to acquire a farm suitable for the purpose at Meiktila handicaps efforts in this direction. No new crop gives promise of approaching groundnuts in general utility on dry soils, but experiments are being conducted at Mandalay with wheat from the drier parts of Australia and with lucerne, and some plots of cassava have been put down. The last named crop seems to require a good deal of water to start it but, when establisned, is likely to resist drought well.

Hill cultivation.

26. The preservation of forests at the headwaters of streams in the Bhamo District having engaged the attention of Government, the Department was requested to advise and assist in respect of the improvement of agricultural methods in the Kachin Hills of the district. Mr. Thompstone made an extended tour in the neighbourhood and ascertained the nature of the soil, which is very impoverished except in a few places, the crops grown and the manner in which they are now cultivated. His suggestions for improvement include methods of manuring, the rotation of crops, and means for the encouragement of the cultivation of new or recently introduced crops. In communication with the Deputy Commissioner, attention is now being devoted to furthering the adoption of these measures. One great obstacle in the way of the profitable growing of most crops is the difficulty of transport which precludes the cultivation of crops which yield produce bulky in proportion to its value, except for local consumption. Fortunately a suitable medium for the demonstration of improved methods exists in some schools where agricultural instruction is already given, and where there are gardens in which experimental work may be done.

The visit of Mr. McKerral to the Chin Hills in connection with wheat cultivation has already been mentioned.

Diseases of plants and insect pests.

27. The Imperial Mycologist, Dr. Butler, has not yet arrived at any decision regarding the decay of the orange trees in Moulmein, nor has the particular disease which is the cause of the decay been identified. Destructive attacks on cocoanut palms by the rhinoceros beetle are reported from the Hanthawaddy and Thatôn Districts, and the Entomological Assistant has been sent to demonstrate to villagers in the affected areas the methods of dealing with the pest.

Economic Products.

28. The Reporter on Economic Products to the Government of India is continuing his classification of the numerous varieties of Burmese peas and beans, and has collected specimens in large numbers with the assistance of the Deputy Commissioners of the various districts in Burma where they are grown.

Samples illustrating indigenous paper manufactures in Burma were procured for study and exhibition in the Indian Museum; and specimens of the principal crops grown in the Province were sent to the Acting Consul-General for Italy at Calcutta for the use of the Colonial and Agricultural Institute of Florence.

Agricultural shows.

29. An agricultural and live stock show was held at Bhamo on the 17th and 18th March 1909, and was attended by Colonel Evans and Mr. Thompstone. This was the only show of the year. The prevalence of plague and cattle disease adversely affected the attendance and the number and quality of the exhibits of live stock, which were inferior to those of former years. The exhibits of vegetables and agricultural produce were, however, as good as ever. Of the provincial grant to the show of Rs. 1,745, a sum of Rs. 1,141, was expended on prizes, and Rs. 420 on contingencies.

The grant of Rs. 300 was continued to the Upper Burma Horse Show held at Mandalay in the second week of November 1908. The Burma classes educed some good animals, particularly brood mares.

A small exhibit of products of economic interest, models of useful implements, and specimens of insects injurious to crops and animals was sent to the annual exhibition in February of the Agri-Horticultural Society of Burma, and attracted considerable attention. The Assistant Botanist, Mr. Sawyer, accompanied the exhibit and during the exhibition and for a few days afterwards delivered a series of simple lectures on the economic importance of the plants and products shown, and explained the habits and peculiarities of the insects. Besides the general public, a large number of students from the Rangoon schools and youths from the Young Men's Christian Association attended the lectures on special invitation.

Agricultural education.

30. It was not found possible to conduct any regular course of instruction during the year except the practical instruction of the subordinate staff. Applications for admission to the College continued to be received. A syllabus of the instruction to be given has been drawn up and detailed arrangements have been worked out, but the postponement of the opening of the college precludes further action.

The Assistant Botanist delivered a course of twenty lectures on wheat cultivation to the three Shan students who were deputed from Kêngtûng and gave them practical demonstrations on the farm and in the Sagaing District. At the end of the course he examined them and from the results there is reason to believe that they derived benefit from the teaching they had received.

The "Handbook of Agriculture for Burma" has been selected by the Education Syndicate as a text book for use in schools. It is being revised in this office so as to meet the requirements of students for the Anglo-Vernacular High School Final Examination.

Publications.

31. It has been decided to publish the set of Climatological Tables compiled by Mr. Warth for some of the principal districts of Burma in the form of a bulletin and copies are now available for sale and distribution. A bulletin by Mr. Thompstone on the subject of "Granary pests in Burma" is also being published. Bulletins can be obtained

by the public at two annas a copy. The interest taken in leaflets issued by the Department is well maintained and the Deputy Director reports that when on tour he found that they were eagerly read by cultivators. The following have been published and distributed during the year:—

No.	Subject.	Author.	Languages.
1	2	3	4
7	Cultivation of cabbage, cauliflower and lettuce.	Mr. A. McKerral, M.A., B.Sc. ..	English, Burmese and Karen.
8	Cultivation of turnips and kholrabi.	Do. ...	Do.
9	Cultivation of carrots, radish, beet and parsnip.	Do. ...	Do.
10	Cultivation of peas, broad beans, French or kidney beans.	Do. ...	Do.
11	Cultivation of onions and leeks	Do. ...	Do.
12	Tobacco cultivation ...	Do. ...	Do.
13	Cultivation of maize ...	Do. ...	Do.
14	Cultivation of cotton ...	Do. ...	Do.
15	Cultivation of jute	Do. ...	Do.
16	The use of the small bullock hoe	Do. ...	Do.

Leaflets 7 to 11 are intended for distribution with the English vegetable seeds which are issued annually to certain districts. Thanks are again due to missionaries for the assistance they have given in circulating the leaflets and in translating them into Karen.

Several articles by officers in Burma appeared in the Agricultural Journal of India during the year under report. A list of them is given below :—

(*a*) Some fibre plants of Upper Burma; by Leon Aubert, B.A., B.Sc., Superintendent of Land Records.

(*b*) Rice cultivation in Lower Burma; by A. McKerral, M.A., B.Sc., Deputy Director of Agriculture.

(*c*) The food of the people in times of scarcity in Upper Burma; by L. Aubert, B.A., B.Sc., Superintendent of Land Records.

(*d*) The furlough wanderings of a Director of Agriculture; by J. McKenna, M.A., I.C.S., Director of Agriculture.

(*e*) The cultivation of turmeric on the foot-hills of Toungoo; by A. M. Sawyer, Assistant Botanist.

(*f*) Cultivation of maize in the Pakôkku District of Upper Burma; by Captain F. C. Owens, I.A., Settlement Officer.

Seed sent out of Burma.

32. Samples of paddy were supplied for experimental cultivation in Spain and British Guiana, and of hill paddy for trial at the Botanic Gardens at Palmerston in South Australia. Teak seeds were sent to Beira and Lyallpur, and khaki-coloured cotton to Rewah; and some Sagaing wheat was furnished for experiment at Pretoria.

Miscellaneous.

33. In November the Agricultural Department took over from the Land Records Department the subject of "Rainfall" and the duty of supplying standard measuring baskets to district officers. It has been suggested that as the rapid spread of the co-operative credit movement has rendered it almost impossible for one Registrar to deal with it, a portion of Burma should be assigned to the Director of Agriculture as Joint Registrar. From the agricultural standpoint this is desirable, because the Department would be brought into touch with corporate bodies of cultivators and have increased facilities for making its operations known and introducing new methods and crops.

The clerical work of the Director's office has much increased and the full efforts of the staff have to be exerted in order to cope with it.

Conclusion.

34. The year has been an anxious one for the Agricultural Department which has felt the financial depression severely but looks forward hopefully to better days. The most gratifying feature has again been the great interest taken by the commercial community

and the general body of agriculturists. While Burman and Indian correspondents have increased much in number, it is hoped to get still closer to the body of agriculturists through the Co-operative Credit Societies and the agency of missionaries. The year has been a notable one in the development of agricultural commerce. The opening of a flour mill in Rangoon; the flotation of companies for jute and sugar; numerous enquiries as to lemon grass oil; proposals for the extraction of fibre from plantains; the starting of parboiled rice to meet the Ceylon market—all these are evidences of agricultural activity, in many of which the Department is pleased to say it has been privileged to give assistance. It is always willing to do so and welcomes all enquiries from commercial men. Thanks are again due to district officers for valuable suggestions made or definite problems suggested. Chief amongst them may be mentioned Mr. E. C. S. George: Mr. G. W. Dawson: Mr. Rigg: Major Bowen: Mr. Chalmers and Mr. Grantham. Nor should Mr. C. F. Grant, whose interest in the subject is still keen, be forgotten. Amongst Settlement Officers, Messrs. W. J. Keith and Hardiman have rendered much help and amongst Superintendents of Land Records, all of whom give most willing assistance, the Department is under the greatest obligations to Mr. Körper and Mr. deSouza. With our very small staff it is impossible to come into touch with the numerous problems which the country presents unless those locally acquainted with them bring them to our notice. We welcome all such suggestions and proposals and will gladly give all the help we can.

S. A. SMYTH,

MANDALAY, 10*th August* 1909. *Offg. Director of Agriculture, Burma.*

APPENDICES.

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APPENDIX I.—Statement of receipts and expenditure for experimental cultivation during 1908-09. 15

APPENDIX II.—Administrative Report of the Agricultural Station, Mandalay, for 1908-09. 17

Receipts and Expenditure for experimental cultivation during the year 1908-09, *exclusive of the Agricultural Station, Mandalay.*

No.	Stations.	Budget allotment.	Receipts from sale of produce.	Expenditure.							Total.
				Establishment.	Wages of farm maistries and coolies	Feed and up-keep of stock.	Purchase of seed and fruit trees.	Up-keep of gardens, fencing and trenching.	Purchase of live stock and agricultural implements.	Miscellaneous contingencies.	
1	2	3	4	5	6	7	8	9	10	11	12
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Bhamo (Sinlumkaba).	1,670	104	1,220	...	...	50	123	...	...	1,393
2	Chin Hills (Falam)	1,360	193	720	....	...	224	75	...	109	1,128
3	Katha ...	1,850	156	947	...	...	14	...	14	168	1,143
4	Myitkyina ...	* 2,006	177	801	...	...	25	824	...	13	1,663
5	Southern Shan States (Taunggyi).	4,646	463	3,041	179	150	302	...	75	277	4,024
6	Distribution of seeds from headquarters.	5,000	...	...	...	...	2,280	...	...	...	2,280
7	Distribution of agricultural implements.	12,000	...	...	...	...	...	...	...	...	...
8	Sericulture ...	500	...	...	...	...	...	...	...	...	...
	Total ...	29,032	1,093	6,729	179	150	2,895	1,022	89	567	11,631

* Includes provision for Sima.

ADMINISTRATIVE REPORT OF THE MANDALAY AGRICULTURAL STATION FOR THE YEAR 1908-09.

1. *General.*—Very good progress has been made at this station during the year and, although the season has not by any means been an ideal one for experimental work owing to very irregular distribution of the rainfall, several series of experiments with paddy, jute, wheat and cotton have been initiated as described in the Scientific Report. The crops generally have been satisfactory and, apart from the produce sold and distributed, the amount of seed, grain, fodder, implements, etc., has, in case of most kinds, been raised up to working limits. This should tend to keep down the expenditure on new seeds, implements, etc., in future years.

2. *Staff.*—The farm has been entirely under my direction, in the hands of a Superintendent, one overseer and five sub-overseers. During a part of the year, however, the staff has not been up to full strength. Mr. A. E. Noyce, sub-overseer, resigned his appointment on February 3rd and his place remained vacant for two months, after which Maung Ba II, who has been apprentice for over two years, was promoted to the appointment. On April 19th, 1909, Maung Ba I and Maung Po Than, sub-overseers, were temporarily transferred by the Director of Agriculture to Hmawbi. The vacancies were not filled and they returned to their substantive appointments on May 6th. The Superintendent is industrious and attentive to duty, and the overseer and sub-overseers are acquiring much useful knowledge in connection with their work, but they all lack training in agricultural and experimental work. This is a great drawback and necessitates not only constant and close supervision but personal attention to many details of the work which might otherwise be done by them.

3. *Labour.*—The cost of labour in Burma is high and the wages for the year have reached a considerable sum as the farm is a very large one. But, as a great deal of the money spent on labour has been sunk in permanent improvements, it is hoped that as these latter are gradually completed the amount of money required under this head will proportionately decrease. In addition to the ordinary farm work of cultivation, attendance on cattle, etc., many coolies have been engaged in making drains, roads, permanent plots and bunds and in the stumping of trees and jungle bushes. A certain amount of attention has also been given to the making of improvements around the new office and laboratory and, as there is no separate allotment for this purpose, the expenditure on wages is included in the farm accounts.

4. *Cattle.*—At the beginning of the year there were thirteen pairs of work cattle valued at Rs. 1,807. Nine and half pairs of bullocks and two pairs of buffaloes have been bought during the year. One pair of bullocks which belonged to Government and had been used in the Katha garden was also shipped to this farm when that garden was closed. They are old and their value is not high, but they are worth more as work cattle than for sale, hence it was considered better to transport them than to sell them in Katha. One buffalo, unfortunately, died during the year, but has now been replaced at a cost of Rs. 48. With this exception, the cattle have been free from disease and are now quite healthy. The total value is estimated at present at Rs. 2,570, but, as they are almost all young cattle just beginning to work, the value, apart from loss or accident, may be expected to rise for the next two or three years.

5. *Manures.*—A quantity of stable-manure has been procured from the Mandalay Municipality and this is used for ordinary purposes; but for manurial experiments where uniform quality is essential, our home-made cattle-manure is made use of. We cannot, however, produce sufficient manure for all purposes from our own cattle. The value of farm-yard manure on hand is estimated at over Rs. 250, but as this amount is calculated to be in hand at the end of each year, it is not entered into the statement of accounts given below. The value of artificial or chemical manures, including bone meal and cotton cake, for manures which we have in stock is calculated at Rs. 757.

6. *Implements and Machinery.*—A fairly large sum has this year been spent on implements and machinery; but, as this includes several of the most expensive machines we shall require, of which one only will be required for our own use, this expenditure will not recur. It also includes several stock machines and implements which are for sale or to be lent out for trial and not for use at this station—two winnowing machines and some ploughs. Some of these have already been lent out for trial. A few kinds of implements, as described in the Scientific Report, are made in our own workshop, and new ideas in and improvements on implements are being tried.

7. *Seeds and Produce.*—During the year the sum of Rs. 967-14-9 has been paid into the treasury for produce and seeds sold off the farm. The value of seeds distributed free or by book transfer through the Director of Agriculture up to June 30th, amounts to a total of Rs. 198-6-0.

At the same date the value of seeds in the store-rooms, taken at market rates, amounted to Rs. 1,301-8-0. The value of fodder in hand amounted to Rs. 147-8-0. In addition to the above, there are also many small samples of numerous kinds of seeds being tried, the value of which it is difficult to estimate, as there is no market to follow.

8. *Buildings, Roads, etc.*—The farm buildings, though not yet quite completed, have been occupied for the last three months of the year. Owing to increase in produce, stock, implements, machinery, etc., it was found impossible to put up in the temporary buildings, hence we transferred to the new ones at the earliest possible moment. When completed, they will be admirably suited to our requirements. A cart weigh-bridge has been obtained and will be fixed near the farm office as soon as the roads near this place are made, so that the right level can be obtained. Much inconvenience is caused by want of a road to and around the buildings. In wet weather it is impossible to approach them, and much delay is caused especially during the rainy season. Several of the principal roads on, to and across the farm lands have been slightly raised so that they may keep dry during the wet weather, and many drains have been cut. The whole farm being almost level, it is extremely difficult to obtain sufficient fall for drainage water—consequently the cost of these improvements is enhanced. Water channels and bunds have also been constructed. The fence around the farm is not completed, and cattle can still enter at almost any point. As during last year, a great deal of damage—not only to the ordinary crops but to the experimental plots—was done by stray cattle, which are very numerous around this part.

9. *Accounts.*—The following statement shows fully the stock in hand, receipts and expenditure for the year.

The value of permanent improvements, on which a large sum of money has been spent, and the value of growing crops (there were about 200 acres under crops at the end of the year) are very difficult to estimate. Hence they are not included in the statement, making the net cost appear much larger than it would be if these values were deducted.

Statement showing receipts of the Agricultural Station, Mandalay, for the year ending 30th June 1909.

	Amount.	Total.
1	2	3
	Rs. A. P.	Rs. A. P.
SALE OF FARM PRODUCE		
Paddy	575 6 3	.....
Gram	239 6 6	.....
Jowar	62 5 6	.....
Peas and beans	18 8 0	.....
Miscellaneous	58 4 6	953 14 9
Sale of implements	14 0 0	14 0 0
Value of seed distributed—		
Book transfer through the Director of Agriculture	120 0 0	.....
Free	78 6 0	198 6 0
Value of produce on hand—		
Paddy	83 6 0	.....
Gram	719 3 0	.....
Wheat	227 8 0	.....
Groundnut	190 8 0	.....
Jowar	7 8 0	.....
Peas and beans	39 6 0	.....
Oil seeds	2 14 0	.....
Fodder	147 8 0	.....
Miscellaneous seeds	31 3 0	1,449 0 0
Value of cattle	2,570 0 0	2,570 0 0
Value of implements and machinery—		
Purchased prior to this year	2,414 8 0	.....
Purchased during the year	4,592 14 9	7,007 6 9
Value of office furniture	303 14 0	303 14 0
Value of artificial manures, bone, meal, &c., on hand, apart from cattle manure	757 0 0	757 0 0
	.....	13,253 9 6
BY NET COST.		
Without deducting the values of permanent improvements or growing crops, which are difficult to estimate.	.....	13,616 5 0
Total	.....	26,869 14 6

MANDALAY, *6th August* 1909.

G. B. C. P. O.—No. 28, D. of A. 15(f), 25-10-1909—437—B. P.

Statement showing expenditure of the Agricultural Station, Mandalay, for the year ending 30th June 1909.

	Amount.	Total.
4	5	6
	Rs. A. P.	Rs. A. P.
Value of live stock at beginning of year	1,610 8 0	.....
Value of pair of bullocks brought from Katha	120 0 0	1,730 8 0
Value of implements and machinery at beginning of year ...	2,624 8 0	2,624 8 0
Value of produce in hand, 1st July 1908—		
Fodder	48 0 0	.....
Seeds	64 0 0	112 0 0
Value of manure apart from cattle-dung	*Nil.*	.....
Value of office furniture, including surveying instruments, etc., 1st July 1908.	316 6 0	316 6 0
Postal charges	32 1 0	.....
Telegraph charges	3 3 6	35 4 6
Freight, shipping and landing charges on seeds, implements, manures, etc.	624 5 6	624 5 6
Wages for farm maistries and coolies, including wages paid for permanent improvements done by contract.	11,170 10 6	11,170 10 6
Feed and up-keep of stock	1,330 12 0	1,330 12 0
Purchase of seeds, fruit-trees, etc.	622 6 6	622 6 6
Up-keep of farm, fencing and trenching, including cost of artificial manures.	1,417 13 0	1,417 13 0
Purchase of live stock	1,789 8 0	1,789 8 0
Purchase of implements and machinery	4,592 14 9	4,592 14 9
Office expenses and miscellaneous	502 13 9	502 13 9
Total ...	.....	26,869 14 6

E. THOMPSTONE,
Principal of the College of Agriculture.

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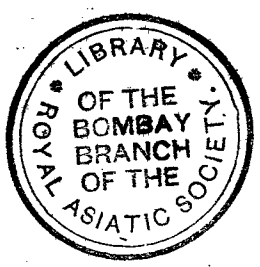
REPORT

ON THE OPERATIONS OF THE

DEPARTMENT OF AGRICULTURE

BURMA

For the year ending the 30th June 1910



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From J. J. ANDERSON, Esq., I.C.S., Assistant Secretary to the Financial Commissioner, Burma, to the Revenue Secretary to the Government of Burma,—No. 13—5R.-107, dated the 3rd October 1910.

I am directed to transmit the report on the working of the Agricultural Department for the year ending on the 30th June 1910.

2. The department has established itself and become known to the people. Its improved implements of simple pattern, the seed drill and the angle harrow, are gaining acceptance among cultivators. The implements can be made in the villages. The prospects of effecting practical progress among small cultivators lie mainly in this direction, in the selection of the best varieties of seed and in selecting and popularizing the better methods with which the more enterprising cultivators have experimented. Naturally, the experiments made on the Department's own farm aid its officers in arriving at conclusions on these points. The Burman cultivator is not intensely conservative. He will adopt a new implement, a new method or a new crop if he can be satisfied that a profit will result.

3. *Paragraph* 3 *of Report.*—Mr. Gates much regrets the departure of the Second Agriculturist. When the finances permit, his restoration is expedient.

4. *Paragraph* 7.—The Financial Commissioner hopes that the classification of soils will shorten the time within which an officer posted to land revenue settlement duty can obtain a working knowledge of one of the most important factors in determining the grouping of fields for purposes of assessment.

5. *Paragraph* 17.—The results in Akyab District are disappointing. The attention of the Chamber of Commerce will be invited to this matter.

6. *Paragraph* 18.—It should be worth while for Government to pay rather a higher price for a few years in order to establish the local cultivation of wheat and thus eventually to reduce prices and to save elaborate arrangements for the transport of rations.

7. *Paragraph* 20.—Tree cotton has been recommended by various persons as a catch crop in rubber tree (*Hevea*) estates. So far as our present knowledge goes, it is not a promising crop.

8. As there is no early prospect of opening a Government farm at Meiktila or elsewhere in the dry zone, the Agricultural Department will be well advised to take on lease small areas of upland for experimental purposes.

9. *Paragraph* 27.—The Director has been requested to obtain and tabulate certain information regarding periods of rotation, kinds of crops grown, etc., in the various areas where the practice of *taungya* cultivation prevails. Many Buddhists entertain, as is well known, a prejudice against the silk-growing industry, but the matter is worth further investigation. Many of the hill tribes are not Buddhists.

10. The Agricultural Department is doing useful work and is well worthy of expansion when funds permit. But the time for establishing an Agricultural College does not seem to Mr. Gates to be near.

REPORT

ON THE

OPERATIONS OF THE DEPARTMENT OF AGRICULTURE, BURMA,

For the year ending the 30th June 1910.

PART I.

ADMINISTRATIVE.

Personal.

1. Mr. S. A. Smyth, I.C.S., acted as Director of Agriculture till my return from leave on the 28th September 1909. I was in charge of the Department during the remainder of the year under report. With effect from the 10th of November 1909 I was appointed a Joint-Registrar under the Co-operative Credit Societies Act (X of 1904) and relieved Mr. English of Co-operative Credit Work in the Mandalay, Kyauksè, Meiktila, and Yamèthin districts. At the beginning of February 1910, I was appointed Provincial Art Officer, in place of Mr. H. L. Tilly who has left Burma. All these appointments bring me into very close touch with the arts and industries, technical and agricultural, and the economic interests of the country.

Tours.

2. During the year under report I was on tour for 169 days and visited the following districts, namely, Mandalay, Kyauksè, Meiktila, Yamèthin, Shwebo, and Bhamo in Upper Burma, and Toungoo, Pegu, Thatôn, Amherst, Ma-ubin, Hanthawaddy, Bassein, Tavoy, and Mergui in Lower Burma. Owing to pressure of work I was unable to attend the meetings of the Board of Agriculture at Pusa in February, and the Department was represented by Mr. F. J. Warth, M.Sc., the Agricultural Chemist.

Curtailment of Staff.

3. The proposals submitted by the Local Government for the restriction of the superior staff, owing to financial pressure, were sanctioned by the Government of India, but no reduction of staff followed until the appointment in June of Mr. McKerral, B.Sc., as Assistant Inspector-General of Agriculture in India. At the end of the year therefore I am left with only two European officers, a Deputy Director and an Agricultural Chemist. It is unfortunate that this unavoidable restriction of staff should come at the present stage when the Department is gaining a footing and when enquiries for inspection and advice are pouring in from all sides. In view of the peculiar conditions of our work, the necessity for the early opening of farms both in Lower Burma and in the Dry Zone, and of the fact that the earliest promise of results seems to come from remote parts of the Province like the Chin Hills and the Kachin Hills of Bhamo, I hope it may soon be possible to obtain a second Deputy Director as well as an Economic Botanist. With the charge of the large experimental station at Mandalay, the training of students, and the answering of increasing number of enquiries it is quite impossible for Mr. Thompstone to travel to any extent, and when the Hmawbi Farm is started his whole time will be occupied in the supervision of the two stations. The curtailment of staff has meant the cessation of th e Agricultural Surveys, a work of the first importance, and an increasing delay in dealing with applications for assistance, and, if it is impossible to have two more officers, I should say that in the present conditions of Burma a second Deputy Director is, if anything, more necessary than an Economic Botanist. I do not underestimate the scientific foundations on which scientific agriculture must rest, but the pressing problems are new

crops, selection of seeds, cheap manures, and improved implements, and on these matters the scientific agriculturist can give great and immediate help. Already the work is more than one man can undertake, and, if progress is to be at all commensurate with demand, another agricultural expert will be required.

Expert Staff. The Agricultural Botanist.

4. On account of financial pressure the Agricultural Botanist, recruited for Burma, has not yet been posted to the Province. He is at present on special duty in the Bombay Presidency.

The Deputy Director. (Mr. Thompstone.)

5. Since the departure of Mr. McKerral the official appellation of Mr. Thompstone is Deputy Director of Agriculture. Prior to this he was Additional Deputy Director. Mr. Thompstone was on privilege leave from the 17th February to the 30th May 1910. During the year his principal work has been the charge of the Mandalay Experimental Station which is rapidly being improved. Roads and drainage channels have been laid out and the grounds around completed buildings have been cleared and planted with trees. Apart from the experimental field work, the details of which will be published in the Scientific Report of the Mandalay Experimental Station, Mr. Thompstone's special work has been a comparative study of wheat, the paddy of Upper Burma, cotton, jowars, and gram and the numerous peas and beans of Burma. He also supervised and arranged the Departmental exhibit for the annual show of the Agri-Horticultural Society of Burma. The bulk of Mr. Thompstone's touring was in the Yamèthin District, the Agricultural Survey of which he has begun. An attempt at well-irrigation by means of a water-lift worked by bullock power was also made at Nabugyin, but has been temporarily suspended owing to the opposition of the landowner. It is hoped that it will be possible to make arrangements to complete the work shortly.

The Deputy Director (Mr. McKerral)

6. At the beginning of the year under report Mr. McKerral was engaged with the completion of the Agricultural Survey of the Myingyan District which has now been published. He also assisted in the management of the Mandalay Station during Mr. Thompstone's absence on tour. In September he began the survey of the Sagaing District, and was occupied in this work, with occasional intervals, till the middle of January. The report is now in the Press. He took charge of the Mandalay Experimental Station during Mr. Thompstone's absence on privilege leave; he also arranged for the leasing out of the Hmawbi Farm to cultivators, toured in the Maymyo Subdivision in connection with the enquiry into *taungya* cultivation, and answered many enquiries on agricultural subjects. He left Burma on the 12th June to take up his appointment as Assistant Inspector-General of Agriculture in India. His transfer is a serious loss to the Department.

The Agricultural Chemist.

7. The Chemical Laboratory, under the direction of Mr. F. J. Warth, M.Sc., Agricultural Chemist, has now been open for two years, and the second year shows a marked increase in output of work over the first.

In 1908-09 only 110 analyses of all kinds were made, while during the year under report 257 analyses and 353 silt and water determinations have been made so that the work has been practically quadrupled. The following detailed summary will indicate the nature of the analyses performed:—

(*a*) Soil analyses	101
(*b*) Sugar-cane analyses	78
(*c*) Paddy analyses	54
(*d*) Silt analyses	20
(*e*) Miscellaneous analyses	4
(*f*) Silts and waters examined	353
Total ...	610

During the year full reports were submitted on the sugar-canes and sugar-cane soils of Burma, and the results will shortly be published in the form of a bulletin of the Department. The work was undertaken at the request of the Officiating Financial Commissioner. A report was also submitted on the alkaline soils of Padu (Sagaing District) and the possibility of their amelioration. An examination was made of the manurial value of paddy-husk, and the soils of Pyintha Township, Maymyo Subdivision, were examined in connection with the enquiry on *taungyas* suggested by Mr. La Touche of the Geological Survey of India.

The prosecution of the enquiry into the source, supply, and agricultural value of the canal and river silts of Burma has occupied a considerable amount of time. The investigation is approaching completion and it is hoped that results will be obtained which will be of much scientific and practical value. Good progress has also been made with the chemical and mechanical examination of the soils of the Meiktila District and all the various soil analyses which have been made add to the material available for an ultimate soil survey of the Province. It is hoped shortly to issue a preliminary note on the commoner soils which will assist Settlement Officers to make more accurate identifications of soils.

On paddy, the principal crop of the Province, Mr. Warth has started two enquiries. The first is a general enquiry to determine in what way each of the important soil and manure ingredients affects the growth of paddy. This involves the detailed study of a single well-known variety grown under varying conditions. The second enquiry is a comparative study of the best known varieties of paddy. This enquiry should ultimately show whether it is or is not possible to improve outturns by growing some particular variety on a definite soil under definite conditions. To ensure that no important character of the crop is overlooked any peculiarity encountered in the course of the investigation will be taken up and worked out in detail.

In connection with specific enquiries, Mr. Warth visited during the year Mahlaing, Legyi, Pyinmana, and Bilin (Thatôn District). He also attended the meetings of the Board of Agriculture at Pusa and, in April, with the approval of the Local Government, conducted the Diploma Examinations at the Madras Agricultural College, Coimbatore.

Sanction to the construction of quarters for the Agricultural Chemist has been accorded and they are in process of erection.

Subordinate Scientific Staff.

8. The Subordinate Scientific Staff consists of the same officers as last year. The Agricultural Chemist reports favourably on the work of Mr. Darabsett, B.Sc., Chemical Assistant, and of the two probationers.

Mr. Shroff, the Entomological Assistant, has continued his investigations into the insect pests of cotton and has nearly completed the work. Exotic and indigenous varieties of cotton have been grown, together with *Hibiscus esculentus* as a trap crop, with a view to ascertain which varieties are less liable to insect attacks and to what extent the trap crop tends to protect cotton.

The numerous insect pests discovered on the Mandalay Station gave Mr. Shroff ample material to test remedial processes, and the successes obtained with several methods will justify their general recommendation.

From July to September Mr. Shroff was on tour in the Thatôn and Hanthawaddy districts investigating the ravages of the rhinoceros beetle, and explaining to the villagers and demonstrating to them remedial measures for the eradication of the pest. During February and March Mr. Shroff was occupied at the Government Garden at Taunggyi, Southern Shan States, where he instructed the Head Gardener in the use of insecticides. Shorter tours were also made to investigate insect attacks reported by cultivators.

During the year considerable additions have been made to the general and economic collections of the Museum.

Mr. Sawyer, Assistant Botanist, has been fully occupied during the year. The botanical survey of the paddies of Upper Burma has been completed, and it is hoped that the result will be a simplification of the present confusion of names and varieties, and a guide to the determination of type characteristics. The survey of indigenous wheats and cottons, laid down by the Board of Agriculture, is in progress. The elucidation of the varieties of the Peas and Beans of Burma (whose name is legion) is progressing, but it will be some years before the work can be completed. Work on the oils of Burma, which it is proposed to carry out with the help of Schimmel & Co., Leipzig, is in progress. It is hoped that the scientific results may awaken a commercial interest.

An important tour was made in the Karen Hills of Toungoo in connection with a proposal to revive the silk industry there. This matter will be referred to in detail in a later chapter.

The collection of botanical specimens has been continued. Collections are being made in duplicate as it is proposed to have a permanent collection of economic products in the Council Hall of the Agri-Horticultural Society where it will be more accessible to commercial men.

The advice of the Assistant Botanist has been asked for on many subjects, and there have been many enquiries about rubber. Although this subject is dealt with by the Forest Department the public seem to look to us for advice which we are always willing to give.

Buildings.

9. During the year a road from the office to the farm buildings has been practically completed. An exit road to the west is under construction. Quarters for six menials attached to the offices have been constructed and estimates for the pumping plant, etc., have been sanctioned. It is hoped that this work will be expedited.

PART II.

AGRICULTURAL STATIONS AND EXPERIMENTAL GARDENS.

Number of Stations.

10. Although budget provision exists for the Hmawbi Agricultural Station it will not be possible to lay out an area for experimental work till the dry weather. The whole farm has therefore been again let out to cultivators, but it is hoped to start operations there next season.

The Mandalay Agricultural Station was in full working order and a report on its administration by Mr. Thompstone, the officer in charge, is printed as an Appendix to this Report. The Station was visited in November by His Honour the Lieutenant-Governor.

Experimental Gardens.

11. Experimental gardens are maintained at Sinlumkaba in the Bhamo District; Myitkyina; Falam, Tiddim, and Haka in the Chin Hills; and Taunggyi in the Southern Shan States.

Sinlumkaba, Bhamo District.

12. With the substitution of Chinese for Indian gardeners every branch of experiment has improved in a marked degree. The garden is used as a training ground for the pupils of the Government Model School. They receive a two-hours lesson every Thursday and put their theory into practice in the School garden. The principal experiments are green manuring with sunn hemp; the cultivation of wheat, oats, pears and cherries, and English vegetables. The most practical part of the work

is the cultivation of the cereal crops. Mr. Todd-Naylor writes: "the garden is an object lesson to the Kachins, and its use is chiefly in that direction. The school boys will, it is hoped, in time try in their own homes experiments which they have witnessed at Sinlumkaba. They should be encouraged to do so." My thanks are again due to Mr. D. W. Rae for the enthusiastic interest he takes in the garden and general experimental work.

Myitkyina.

13. This garden continues to do well and in a year or two it may probably be considered to have fulfilled its functions. We have found what kinds of fruit trees are likely to grow and it may be left to private enterprise to develope the fruit industry if it is worth the trouble. Fruit trees and English vegetables did well, but it seems unnecessary that Government should bear the trouble and expense of growing produce for the market which it is found can be grown equally well by private individuals.

Chin Hills.

14. In the Chin Hills the weather conditions were somewhat unfavourable, the rainfall being the heaviest on record. It is proposed to increase the pay of the head gardener so as to obtain a better man.

In the gardens all the fruit trees are flourishing but, with the exception of the peach and the small black plum, bear very little fruit. Pruning and root exposure will be tried this year. In Tiddim and Haka the apple trees are bearing well and the size and quality of the fruit is improving. At Tiddim cuttings of apricot and plum trees are promising. The supply of vegetables has been continuous and equal to the demand. The garden at Tiddim is greatly improved and an excellent variety of vegetables is obtainable there. The cultivation of potatoes has been taken up by the Chins and onions are well established. For the present, however, these gardens must be looked upon mainly as adding to the amenities of life in these remote tracts, and their effect on the general cultivation of the Hills must be slow.

Taunggyi, Southern Shan States.

15. The condition of the garden is not satisfactory, and I propose to visit it soon with the Deputy Director, and consider what measures are necessary to put it on a sound footing. The completion of the railway, now under construction, will give an outlet for produce which cannot at present be exported at a profit. It is therefore important that the possibilities of the garden should be fully investigated and this I propose to do as soon as possible. The Entomological Assistant visited the garden in February and found it swarming with insect pests. He explained fully to the Head Gardener the remedial measures necessary and a supply of insecticides for the garden has been indented for. Full notes on the various pests will be sent at the same time.

During the year tobacco did well; as did potatoes and coffee. Supplies of the latter were sent to Mandalay and Toungoo. Tree tomatoes do exceedingly well and a quantity of seed was distributed throughout the States. Various fruit trees were supplied to Maymyo and Myitkyina and a number were sold locally. Of a total of 8,247 fruit trees only 1,654 are bearing fruit. This is a disappointing proportion.

In view of the importance which the States will acquire as the result of the opening of the Railway it will probably be necessary to considerably expand the scope of the garden and increase the supervising staff. Proposals will be submitted after inspection.

Financial aspect.

16. The total expenditure under all heads on the maintenance and upkeep of the gardens was Rs. 7,824 and Rs. 1,368 was realised from the sales of produce. The nett Government expenditure was thus Rs. 6,456 or Rs. 1,802 less than last year.

PART III.

EXPERIMENTAL CULTIVATION THROUGH DISTRICT AGENCY, DISTRIBUTION OF SEEDS, ETC.

Introduction of "moisture-resisting" paddy into the Akyab District.

17. The total outturn from the seed of the imported variety is estimated to have been about 73,000 baskets. The cultivation has increased slightly and large quantities of the grain were disposed of to European millers. The price paid is reported to have been lower than that paid for Necranzie. If this is so the cultivators naturally will give up the new variety. The experiment was made at the express request of the European rice-millers. The report of Europe buyers is: "We find the grain to be of very good quality. In our opinion the rice is worth the full value of Moulmein No. 1, provided, of course, that special precautions were taken when shipped together with Necranzie rice, to prevent the grain being affected by any heating of the latter." Government has, I think, done all it can be expected to do, and if Akyab buyers like to kill the new variety by paying lower prices for it than for the despised Necranzie as they are reported to be doing, they need not be surprised if the variety disappears. On the other hand, there is no doubt that there is great deterioration owing to the slovenly and careless cultivation of the Arakanese, and a loss in other qualities may discount its "moisture-resisting" advantages. Demonstration farms will certainly be necessary in Arakan when funds and staff are available.

Wheat.

18. The development of this important cereal is going on apace—but it is rather in the remoter parts of the Province than in the main agricultural areas. At the same time the development of the cultivation in inaccessible tracts like the Chin Hills and the Kachin Hills of Bhamo is of the greatest importance to Government as it will greatly reduce the cost of rationing the Military Police stationed there.

In the Chin Hills the crop was again grown with great success and the total yield far exceeded expectations and this in spite of many failures due to the hard frosts and the heavy rains experienced in December and January. The total yield obtained was over 300,000 pounds of which about 250,000 pounds were sold to the Military Police, the balance being retained as seed for next year's sowing. In order to ration the Military Police a yearly supply of 300,000 to 350,000 pounds is required. If the conditions are favourable there should be no difficulty in obtaining this yield next year. For this most gratifying result great credit is due to Mr. W. Street, who initiated the movement, and to Captain Burne, Superintendent of the Chin Hills, who has brought the experiments to such a satisfactory result.

Experiments with green manure, recommended by the Deputy Director during his tour, were carried out, but were not very successful. With a very small amount of farm yard manure available this is the most effective way of maintaining the fertility of the soil, and the experiments should be persevered with.

As a result of Mr. Thompstone's visit in March 1909 to the Kachin Hills of Bhamo, experiments to introduce wheat into these tracts were begun. A grant of Rs. 200 was made by the Department to assist Kachins in the cultivation of wheat and seed and green-manures were supplied. Experiments were carried out at 11 centres; those at Tunhong by Major F. L. Orman, Commandant of Military Police, and the remainder by Mr. D. W. Rae. The experiments have been moderately successful and should be persevered with. The Deputy Commissioner, Mr. Cabell, considers that the Tunhong experiments appear to indicate that a crop might be grown at every Military Police post in the district sufficient for its annual requirements. If this result can be achieved the saving to Government will be very considerable.

Wheat cultivation shows little signs of expansion in Burma proper. Messrs. Mower and Company, of the Pioneer Flour Mill, Rangoon, have expressed the opinion that the Shan States' wheat is superior in milling quality to any of the Indian and Australian qualities that they can import, but experiments at Mandalay seem to indicate that it rapidly deteriorates under the changed climatic conditions. It should, however, retain its qualities in the frontier tracts, and this is the seed which will be supplied to applicants from these localities. An increasing amount of attention will be devoted to this crop at the Mandalay Agricultural Station.

Groundnut.

19. The area under groundnuts considerably contracted during the year, there being a total acreage of only 140,698 acres under this crop as against 248,497 acres in the preceding year, or a decrease of 107,799 acres. The principal causes of this were the low price ruling in 1908-09 and the suitability of the early rains for sessamum. But as early sessamum shows an increase of 127,844 acres it is probable that much of the area formerly sown with groundnuts was converted to this more valuable crop The reduction in area is really a blessing in disguise. Had the higher prices continued, constant cropping of the same soil with groundnuts would certainly have gone on to the detriment of the soil and the introduction of disease. Nature and trade considerations have forced a rotation, the necessity for which it would have cost us endless labour to impress upon the cultivators. The crop is firmly established and the cultivator has enough sense to know when he can profitably grow it.

New districts into which the crop can probably be introduced are Shwebo, Mandalay, and the Ruby Mines, and selected seeds have been issued to these districts. A success is reported from the Ngaputaw Township of the Bassein District, but it is improbable that they will succeed in Lower Burma except on the lighter soils along the sea-coast. They are being tried in Kyaukpyu where they should succeed.

In order to keep a stock of exotic varieties for seed purposes till the Dry Zone Farm is opened, it is proposed to lease a small area of land north of Mandalay. Here also experiments with Soy Beans will be conducted.

Cotton.

20. Extensive experiments are being made at Mandalay with indigenous and exotic cottons. It is hoped that we shall soon be able to recommend a cotton suitable to the country with a yield and staple superior to the indigenous varieties. There have been numerous demands from private persons for American Sea Island seed to be tried in Kyaukse, Shwebo, Pakôkku, and Amherst Districts. The work abandoned by Miss Haswell in the Amherst District has been taken up by a Taungthu called Maung Thuna at Mi-laung-chaung village in the Amherst District. When I visited the garden—some 30 acres in area—in November the plants looked very well. The principal variety cultivated is the Pernambuco Tree Cotton—formerly tried by Miss Haswell.

Havana and Virginia Tobacco.

21. In accordance with former practise considerable quantities of Havana and Virginian Tobacco seed obtained from America were distributed to districts where the seeds were likely to prove successful. Successes were reported from Thatôn, Myitkyina, Katha, and Minbu and a partial success in Tharrawaddy, but untimely rains and floods rendered inconclusive the experiments in the Upper Chindwin, Toungoo, Henzada and Thayetmyo. Total failures are recorded from Kyaukse, Kyaukpyu, Myingyan, the Northern Shan States, Bassein, and Northern Arakan.

There is absolutely no reason why, if ordinary care is taken and weather conditions are favourable, Havana and Virginian tobacco should not succeed all along the Irrawaddy. Marked commercial successes have already been obtained in the Ma-ubin District and both varieties are well established at Bhamo. A little care in seeing that the seed gets into right hands would lead to equal successes

in all intermediate districts. In view of the exceedingly disappointing results obtained, due to absolute indifference and lack of interest, the distribution of seed will be considerably curtailed and only those districts will be favoured which give evidence of some interest in the matter.

Tea and Coffee.

22. No tea seed was distributed last year: and, for the coming year, arrangements have been made to obtain the seed from the Palaung territory of the Northern Shan States as suggested by the Hon'ble Mr. Todd-Naylor when Officiating Financial Commissioner. It is hoped that this will give better results than if foreign seeds are introduced.

Coffee-seeds were distributed to a few districts which expressed a desire to have them. At Prome a partial success was achieved: at Yamèthin and Bhamo there is promise of success. Considering the doubtful value of the crop and the disasters which have formerly attacked it in Burma the distribution of coffee-seeds will be strictly limited in future.

Malta Lemons.

23. In July 1909, the Council of the Agri-Horticultural Society brought to my notice the great success obtained with thoroughly acclimatised Malta Lemons raised in the Society Gardens. The trees, it was reported, have a wonderful fruit-bearing capacity, and apparently grow well in both the plains and the hills: in the former bearing more fruit and in the latter larger fruit. They grow in Rangoon and in the Hanthawaddy and Tharrawaddy districts very well. In Thandaung they are slow of growth but the fruit is larger. The fruit, it was noted, would find a ready market, and, if the cultivation were largely extended, citric acid and bergamot could be manufactured.

The Society very kindly made over to me 1,400 plants which were distributed as follows:—

Myaungmya	200
Amherst	300
Mergui	200
Thayetmyo	200
Pakôkku	200
Myitkyina	200
Southern Shan States	100

Reports, so far as received, indicate that the plants are thriving.

Tapioca.

24. In order to test the merits of this plant as a drought-resisting crop experiments were made at the Mandalay Farm and also by a private cultivator at Myingyan. An unexpected rise in the river completely destroyed the latter experiment. At Mandalay, although the soil is not quite suitable, fair results were obtained. The conclusion arrived at was that if the plant be grown for food as roots it might form a valuable supplementary food stuff: but that the labour rate is still too high to make it remunerative as a source of starch. Its value as a famine food is discounted by the fact that it requires a great deal of water to start it. In our scarcity areas it is generally a failure of the early rains that brings on famine.

Miscellaneous.

25. Small quantities of jute seed were distributed, with full instructions, to applicants from Hanthawaddy and Bassein. Moderate successes have been achieved. The great danger is excessive rainfall at an early stage of the plants' growth. English Vegetable seeds generally did well, but there were many failures owing to untimely rain. *Tadaungbo* paddy was not in such great demand as it has been in the past. Arrangements are being made to try all the flood-resisting varieties of paddy on the estates of the Hon'ble Mirza Abdul Hoossain, Khan Bahadur, where conditions are favourable, and experiments are now in progress at Mandalay with a *drought-resisting* paddy obtained from Madras. Mr. D'Castro of Moulmein is kindly

experimenting on the manuring of paddy in Lower Burma with bone-meal. At present nearly all of this valuable product is being exported. The agricultural loss to the country is most serious. Arrangements are also being made to hire a suitable piece of land north of Mandalay for experiments with soy beans. The Mandalay Farm soil is not suitable for this crop: but, in view of the commercial importance of the beans, we cannot wait for the Meiktila Farm.

PART IV.

MISCELLANEOUS.

Hill or *taungya* cultivation.

26. The general questions with which the Department has been engaged during the year have, in many cases, been connected with the solution of the difficult problem of *taungya* cultivation. As noted last year the problem was investigated by Mr. Thompstone in the Kachin Hills of Bhamo, and experiments on the lines suggested by him have been begun. The question amongst the Kachins must, however, be largely an administrative one, and it is the traditions of years and the acquired nomadic tendencies of the people that have to be combated. Even if scientific agriculture can completely change the agricultural conditions there is still the temperament of the people to be dealt with, and this is a problem that only the Political Officers can handle effectively.

The Department has now before it numerous proposals for the solution of the problem. These differ with localities. In the Kachin Hills a greater permanency of cultivation which could be effected by manuring and rotation of crops seems the most hopeful line of development. At the recent Forest Conference at Maymyo, which I was invited to attend, Mr. Cubitt insisted on the necessity of a European expert living and demonstrating among the Kachins. With a department containing only one Agricultural Expert this is impossible, but, if a Political Officer, knowing the language and the people, could be specially trained in agriculture much good might be effected.

27. For the *taungya* cultivation of the Shan plateau on which Maymyo is situated, and which consists of unproductive red clay quickly exhausted, Mr. T. D. La Touche, Officiating Director of the Geological Survey of India, has suggested a series of experiments to determine *(a)* whether treatment with lime will render the red clay more productive; *(b)* whether the ordinary *taungya* fields can be rendered more permanent by some simple system of terracing or by deep ploughing; *(c)* the maximum angle of slopes on which such cultivation should be permitted; and *(d)* the effect of denudation by rainfall of the surface soil.

In connection with these proposals a large number of *taungyas* in the neighbourhood of Pyintha have been visited. The soils have also been chemically examined, and the conclusion come to is that several successive years of cultivation might tend to destroy rather than improve their tilth. All the soils are deficient in lime the addition of which would have a similar opening effect upon the soil.

It is exceedingly difficult for the Department to start elaborate experiments of this kind in remote areas until we have a better equipped staff and until more progress has been made on the main agricultural problems of the country. It may however be possible to begin operations this year. The lines of work will be a complete classification of all kinds of taungyas and a careful study, extending over two or three years, of such typical *taungyas*. It would begin by felling of the trees, preparation of the soil in the ordinary worker's methods, careful calculation of outturns, chemical examination of soils at the end of each year's crop, and estimation of the real cause of decreasing fertility. It would also include experiments with manures, preferably the growth of green leguminous manures, and the trial of any other methods which might increase the life of a *taungya*. It is no use starting experiments in the dark or basing them upon suggestions made at random by outsiders rather than upon the personal observations of the Experts

of the Department. But the conduct of all these experiments means men and money, neither of which are, at present, available.

28. Yet another solution of the problem, as affecting the Karen taungya-cutters of the Toungoo District, has been put forward by Mr. Mariano, a planter, now resident at Yedashè. He suggests that the systematic development of the silk industry which at present exists on a small scale might stop taungya-cutting and develope a profitable industry. Mr. Sawyer, the Assistant Botanist, has gone thoroughly into the matter in the Leiktho Township, the Yabein tract and the Paung-laung tract, and it is under consideration whether action should be taken on his proposals.

Miscellaneous questions.

29. Amongst miscellaneous questions with which the Department has dealt have been the manufacture of jaggery from the juice of the toddy-palm, with special reference to the effect of the industry on the timber supply of the dry zone. These papers are being published as a bulletin of the Department. At the request of the Chief Commissioner of the Andamans and Nicobar Islands we advised on the manufacture of butter (ghi) from cocoanut oil; and, at the request of the Financial Commissioner, on a substitute for the bark of the Thitya tree, which is largely used in the manufacture of jaggery. The possibility of organising the cocoanut industry in Tavoy and Mergui has also been considered. The cultivators evince no interest. It is hoped before long to do some work with the Sanitary Commissioner on the utilisation of night-soil and sewage.

Extraction of fibre from plantain trees.

30. An experiment of great interest has been carried out by Mr. Chatterjee, pleader of Ma-ubin, in the extraction of fibre from plantain trees. The manufactory has been inspected by Messrs Smyth, McKerral, and myself, and if capital is forthcoming to float a Company the industry should prove a profitable one.

Insect pests.

31. During the year the damage done throughout the Province to cocoanut palms, by the Rhinoceros beetle, has been fully investigated by Mr. Shroff and myself. A bulletin will shortly be issued on the subject. The insect pests of paddy will now be taken up.

Economic Products.

32. A large number of Economic products were, as usual, collected and sent to the Reporter on Economic Products to the Government of India in accordance with the programme of Collections prescribed by him.

Agricultural Shows.

33. An Agricultural and Live-stock Show was held at Bhamo on the 7th and 8th of March 1910, and was attended by Mr. Cameron, I.C.V.D., and myself. The show was a great improvement both in the number and quality of Exhibits, on all previous ones and it is now established as an annual event. The vegetable classes were exceptionally good, and the Deputy Commissioner, Mr. Cabell, is exerting himself to extend their cultivation on a commercial scale. Of the Government grant of Rs. 1,745 a sum of Rs. 1,305 was expended on prizes and Rs. 360-12-0 on contingencies.

The grant of Rs. 300 to the Upper Burma Horse Show held at Mandalay in December was continued. The Burman exhibits were of good quality and the prize for the best Burma-bred in the Show went to a shaggy little pure Burmese mare of the old type owned by a Burman from Maymyo Subdivision.

A grant of Rs. 600 was sanctioned for the Annual Exhibition of the Agri-Horticultural Society of Burma. The Department had a large exhibit of Economic products, models of agricultural implements, etc., which attracted much notice

and was inspected by many commercial men. The exhibit was awarded the only gold medal given at the Exhibition.

Agricultural Education.

34. A course of instruction in Agriculture, Physics, Botany, Entomology, and Farm Accounts was started on the 1st of June. It is attended by the junior staff and probationers of the Mandalay Farm, and by two pupils deputed from Nyaunglebin to be trained for the conduct of school-gardens. The latter receive stipends from the Agricultural and Education Departments.

The question of school-gardens is gaining prominence, and it is hoped that some development in this direction may soon be possible. We hope to be in a position soon to issue a simple text-book of agriculture.

Publications.

35. During the year under report the following cultivators' leaflets have been issued by the Department:

No.	Subject.	Author.	Languages.
1	2	3	4
17	The Palm Beetle or Rhinoceros beetle.	Mr. K. D. Shroff, B.A. ...	English, and Burmese.
18	The Preservation of Mixtures of Sessamum and Groundnut oil.	Mr. F. J. Warth, M.Sc. ...	Do.
19	The Red Cotton Bug.	Mr. E. Thompstone, B.Sc. ...	Do.
20	Sunn Hemp Cultivation.	Do. ...	Do.
21	The Seed Drill.	Do. ...	Do.
22	The Angle Harrow.	Do. ...	Do.
23	The Pyaung-Sabin (Striga Lutea)	Mr. A. McKerral, M.A., B.Sc. ...	Do.

The demand for these leaflets is unabated. Advantage is taken of my connection with Co-operative Credit Societies to distribute and explain leaflets.

The Report on the Agricultural Survey of the Myingyan District has been published: that on the Sagaing District is in the press. Numerous articles have been contributed to the Agricultural Journal of India by members of the Department and other gentlemen, official and non-official, resident in Burma.

Seeds sent out of Burma.

36. Samples of the principal varieties of seed cotton grown in Burma were sent to the Imperial Cotton Specialist who is engaged on a Survey of Indian Cottons. Samples of *taung deik pan* paddy were sent to Ceylon and Madras, and of *tadaungbo* and *daiksaba* to Travancore. Samples of pure, whole rice and of the by-products produced were supplied to the Board of Agriculture and Fisheries, London. Numerous samples of seeds were also sent to the Director of Agriculture, Formosa, who visited the Farm at Mandalay.

Conclusion.

37. Co-operative Credit work has given me exceptional opportunities for discussing agricultural questions and the result is seen in a great increase of direct correspondence and dealings with cultivators. The Societies will take, to an extent, the place of Village Agricultural Associations, and co-operative disposal of produce is a vision of the not distant future. Enquiries and suggestions come from all quarters: commercial men write freely upon subjects on which they desire information. More problems arise than we can attempt to solve until we are better equipped. The urgent necessity now is the multiplication of experimental farms and demonstration plots: but, until money and men are available to equip these, we must look to help from private individuals to enable us to demonstrate any discoveries we may have made. I have again to express my thanks to District Officers for the interest they have generally taken in the affairs of the Department.

J. MACKENNA,
Director of Agriculture, Burma.

MANDALAY, 4*th August* 1910.

APPENDICES.

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APPENDIX I.

Receipts and Expenditure for experimental cultivation during the year 1909-10, *exclusive of the Agricultural Station, Mandalay.*

No.	Stations.	Budget allotment.	Receipts from sale of produce.	Expenditure.							Total.
				Establishment.	Wages of farm maistries and coolies	Feed and up-keep of stock.	Purchase of seed and fruit-trees.	Up-keep of gardens, fencing, and trenching.	Purchase of live stock and agricultural implements.	Miscellaneous contingencies.	
1	2	3	4	5	6	7	8	9	10	11	12
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1	Bhamo (Sinlumkaba).	1,430	144	895	...	...	50	120	...	16	1,081
2	Chin Hills (Falam)	1,808	212	1,008	...	...	39	1	...	39	1,087
3	Myitkyina ...	1,618	239	918	...	...	181	153	124	...	1,376
4	Southern Shan States (Taunggyi).	4,945	773	2,981	115	47	220	...	156	761	4,280
5	Distribution of seeds from headquarters.	5,000	...	...	...	...	2,867	...	...	...	2,867
6	Distribution of agricultural implements.	5,000	...	...	...	...	...	...	...	...	...
7	Sericulture	500	...	...	...	...	...	...	...	...	...
	Total ...	20,301	1,368	5,802	115	47	3,357	274	280	816	10,691

APPENDIX II.

ADMINISTRATION REPORT OF THE MANDALAY AGRICULTURAL STATION FOR THE YEAR 1909-10.

1. *General.*—The area under permanent cultivation has been raised to upwards of 330 acres and there now remain only a small area under jungle. Many permanent improvements have been made, and the farm is in much better working order than at the beginning of the year. The results so far obtained of experiments initiated in previous years are detailed in the Scientific Report. Only a few new experiments have been started during the year, and before the experimental area can be greatly increased it will be necessary to increase our stock of working cattle. The forty-seven head of cattle at present on the Farm are found to be inadequate even for the work at present in hand, and it is proposed to raise the stock up to thirty-five pairs as soon as bullocks can be purchased at a reasonable price. In order that the whole Farm may be kept under good cultivation at least forty pairs will be required, *i.e.*, one pair for every ten acres. The crops have been on the whole satisfactory, and the outturn of produce has greatly increased. The amount paid into the treasury on account of sales has increased to nearly four times that of last year, whilst the expenditure has greatly decreased.

2. *Staff.*—The farm has been entirely under my control, except the time I was away on leave when it was under the direction of Mr. McKerral, Deputy Director of Agriculture, with the assistance of a Superintendent, one overseer, and five sub-overseers. Sub-overseer Mr. V. A. Skinner was away on privilege leave for two months, with effect from the forenoon of 16th July 1909, during which time Maung Po Min, apprentice, officiated for him. On 16th November 1909, Overseer Maung Po Myat was granted privilege leave for two months and promotion was given according to seniority. Mr. V. A. Skinner resigned his appointment on the 23rd December 1909, and his place was filled by Maung Po Min, apprentice, on the 16th January 1910, the date on which he reverted from officiating sub-overseer consequent on return of the permanent incumbent from leave. Sub-overseer Maung Po Than was granted two months' privilege leave, with effect from the 16th January 1910, and his place was left vacant. The Superintendent and other staff have now become acquainted with their respective work, and are beginning to understand the various undertakings and the object of the work. It may be expected that they will soon be able to run the operations almost entirely from instructions; though so large an area is beyond the capacity of one Superintendent and will consequently always require personal attention. Two probationers, Maung San Thein and Maung Tha Zan, have been entertained, with effect from the 1st and 3rd April 1910 respectively. They are being trained in the work under my supervision; the latter gives promise of making a very useful assistant.

3. *Labour.*—The cost of labour will always be considerable. At present many permanent improvements continue to be carried out and very many more remain to be done. These cannot be carried out very rapidly, but will be done gradually according to the funds and the labour available. Sometimes it is almost impossible to obtain coolies, and this frequently happens when they are most urgently required to attend to the experimental plots. This is a serious difficulty and can only be overcome by providing quarters for permanent coolies. At present they live away from the Farm, many of them at long distances, and it is consequently impossible to retain a hold over them. The provision of quarters would largely obviate the necessity for outside labour which is always expensive. As there is no separate grant for cooly labour required by the Agricultural Chemist, the Assistant Botanist, and the Entomological Assistant the work required by these officers has been carried out by farm coolies and the cost is included under the heading of "Wages for Farm Maistries and Coolies." The cost of the work done around the offices, *e.g.* clearing jungle and rubbish, levelling, planting, and attending to trees, etc., is also included under the same head.

4. *Cattle.*—There are twenty-three and half pairs of bullocks valued at Rs. 3,312. Out of two pairs of buffaloes one unfortunately died during the year. Total value of cattle on the farms is estimated at Rs. 3,475. With the exception of a slight attack of foot-and-mouth disease and the loss of one buffalo from pneumonia the cattle have been healthy and are looking well, but as rinderpest is reported to have been prevalent in the district, every precaution is being taken against this disease and cattle examined frequently. The water supply is a source of great danger, especially as is flows down from the infested area to the north of Mandalay. It is hoped that a good supply will shortly be provided from the well, and it is proposed to put in an "Izal" tank to guard against future attacks of disease, particularly against foot-and-mouth disease.

5. *Fodder.*—We have this year produced more than enough fodder for the use of our own bullocks, and have a considerable quantity on hand which will be sold when it is seen how much will be required to last until the new crops come in. We have fed more largely on pyaung straw and less on paddy straw. The bullocks have benefited from this and practically the only feeding stuff which has been bought has been sessamum cake and a little bran. As far as fodder is concerned the farm will in future be far more than self-supporting; but as we cannot grow sessamum it will always be necessary to buy the cake.

6. *Manures.*—A quantity of stable manure has again been procured from the Mandalay Municipality and home made cattle manure has increased in quantity, though owing to the state of the manure tanks it cannot be properly stored.

The value of artifical manure purchased during the year amounts to Rs. 76 only and the total value of manures in the godowns amounts to Rs. 730.

7. *Implements and Machinery.*—The implements bought this year have been mostly of the less expensive kind, with the exception of a platform weighing machine. The home made implements described in last year's Scientific Report, *viz.*, the angle-harrow and the seed-drill, continue to be made by our own carpenters, and a number have been sold or distributed free of cost. If applications for them continue to increase as at present, it will soon be difficult to cope with the demand, owing to the difficulty in obtaining good carpenters at the present rates of pay and to the lack of a blacksmith. It would be a great advantage if sanction could be obtained for the entertainment of two good carpenters and a good blacksmith on monthly rates of pay.

8. *Seeds and Produce.*—During the year the sum of Rs. 4,154-11-8 has been credited into the treasury for sale proceeds of the farm produce. The value of seeds distributed gratis or by book transfer through the Director of Agriculture up to the 30th June, amounts to a total of Rs. 241-5-8. The value of seeds on hand amounts to a total of Rs. 909-13-2.

9. *Buildings, Roads, etc.*—The farm buildings have been occupied since the beginning of the year. The roofs in several places are, however, still not rain-proof; and there are a few details of construction which are still incomplete. Apart from this they are very satisfactory and convenient. The farm yard was supposed to be metalled, but the contractor did his work so badly that it is now deep in mud in several places. The road to the buildings from the offices is a great convenience, and except in a few places appears to be well made and stands the heavy traffic very well. When the road around the buildings, the bridge over the distributary and the bullock cart road running west to Shanzu road (all of which now are in process of construction) are completed, there will be less traffic towards the offices and less danger of breaking up the road with heavy carts. The raising of the cart tracts to form suitable roads in and about the farm has been continued, and better drainage has, in some places, been secured by digging drains and laying pipes beneath the roads. The fence around the farm is still incomplete and we have a great deal of trouble with stray cattle.

10. *Accounts.*—The attached statement shows the receipts and expenditure for the year.

As during last year many permanent improvements have been effected. The value of the growing crops, though not estimated, is considerably in excess of last year and more land (now upwards of 330 acres) has been brought under permanent cultivation after clearing away the jungle.

Statement showing Receipts of the Agricultural Station, Mandalay, for the year ending the 30th June 1910.

	Amount.	Total.
1	2	3
	Rs. A. P.	Rs. A. P.
Sale of Farm Produce.		
Paddy	2,755 14 4	.....
Gram	981 9 4	.....
Jowar	4 12 0	.....
Groundnuts	95 1 0	.....
Peas and beans	56 15 0	.....
Wheat	246 8 0	.....
Miscellaneous	14 0 0	.....
.....	.....	4,154 11 8
Sale of implements	17 8 0	17 8 0
Value of seeds distributed :—		
Book transfer through the Director of Agriculture	90 6 1	.....
Free	150 15 7	241 5 8
	.....	4,413 9 4
Value of produce on hand :—		
Gram	102 9 7	.....
Wheat	129 13 10	.....
Groundnut	92 0 0	.....
Cotton	12 5 0	.....
Jowar	15 0 0	.....
Peas and beans	39 12 0	.....
Fodder	460 0 0	.....
Miscellaneous	67 4 9	909 13 2
...		
Total ...	.....	5,323 6 6

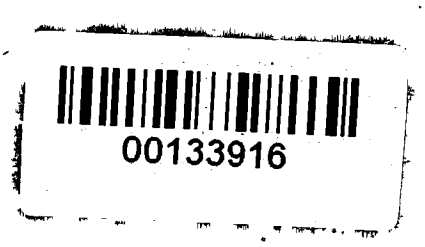
MANDALAY, *6th August* 1910.

G. B. C. P. O.—No. 43, D. of A. 1(*b*), 1-11-1910—418—B. N.

Statement showing Expenditure of the Agricultural Station, Mandalay, for the year ending the 30th June 1910.

1	Amount. 2	Total. 3
	Rs. A. P.	Rs. A. P.
SUPPLIES AND SERVICES.		
*Wages for farm maistries and coolies	8,781 4 8	
Feed and upkeep of stock	703 15 11	
Purchase of seeds and fruit-trees	426 4 3	
Upkeep of garden, fencing and trenching	1,905 5 5	
Purchase of live-stock and agricultural implements	3,028 4 0	
		14,845 2 3
Contingencies :—		
Service postage and telegram charges	0 4 0	
Purchase of furniture	.....	
Freight, shipping, and landing charges	363 8 9	
Purchase of books and periodicals, etc.	.....	
Office expenses and miscellaneous	370 10 11	
		734 7 8
		15,579 9 11
* Includes labour expended for Agricultural Chemist	21 3 9	
Do. Entomological Assistant... ...	170 7 10	
Do. Assistant Botanist	160 11 4	
Total ...	.....	15,227 3 0

E. THOMPSTONE,
Deputy Director of Agriculture.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